ONTARIO

HORTICULTURAL CROPS

RESEARCH & SERVICES COMMITTEE

2001 ANNUAL REPORT

TO

ONTARIO AGRICULTURAL SERVICES

COORDINATING COMMITTEE

JANUARY, 2002

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OHCRSC EXECUTIVE SUMMARY

Research Priorities for Horticultural Crops are coordinated by the Ontario Horticultural Crops Research and Services Committee (OHCRSC). The 16 subcommittees of OHCRSC met during the months of November and December, 2001. The subcommittee chairs presented their reports to the OHCRSC January 9, 2002.

The individual subcommittee reports have been incorporated into this report to provide details on the state of the horticultural industry, emerging issues, priorities and recommendations on a commodity/sector basis. A summary of the priorities and recommendations for all sixteen subcommittees is included as an appendix.

The number of issues facing the horticulture sector are substantial. There was discussion at many of the subcommittee meetings that growers are finding it difficult to look at what needs to be addressed in the longer term when they are feeling overwhelmed by the number of issues that confront them on a daily basis.

Themes for Horticulture

Based on the subcommittee reports, the OHCRSC identified six broader themes for horticultural crops (not listed in priority order):

Environment including but not limited to nutrient management, climate change, water quality and quantity.

Food Safety and Quality including but not limited to post harvest quality, water quality, HACCP quality assurance type programs. The consumer-driven market want processes and systems in place that demonstrate assurances of safe food.

Infrastructure including but not limited to dealing with trade barriers, economics, labour issues, research capacity, and communication. The ability of the industry to rapidly respond to change will have a direct impact on maintaining the level of competitiveness of the Ontario horticulture sector within Canada as well as to continue to explore and expand export markets.

New Product and Market Development value added opportunities including but not limited to life science/bio-based economy approaches. Good understanding of crop management will need a great deal of research. For example, the interaction of fertility levels can effect the level of active ingredient with the plant. Identity preserved processes will be important to compete with other jurisdictions.

Productivity and Sustainability/Competitiveness including but not limited to breeding and cultivar development, production issues other than nutrient management

Pest Management including but not limited to Integrated Pest Management (IPM) strategies and tools, new pests, minor use registrations, and diagnostic tools.

The incidence of new pests has created numerous quarantineable issues in the last several years. More emphasis on proactive versus reactive response (eg. Research on biology and control strategies of emerging pests) will help minimize the impact on the industry. Minor use registration and access to crop protection materials continues to be one of the biggest barriers to horticulture. Progress in resolving issues in this area are imperative or Ontario's competitive position will continue to be eroded.

Recommendations

Nutrient Management

This remains a high priority as nutrient management was raised across numerous OHCRSC subcommittees. This issue will be one of the most significant challenges to horticultural crops due to the diversity and number of crops and the different type of production systems that can be used. Any provincial guidelines or standards that are put into place need to be based on sound research valid for Ontario conditions.

Integrated approach to Horticultural Research

OHCRSC believes that an integrated approach to horticultural research is essential as needs continue to grow with new crops, new and emerging crop pests, new issues and marketplace pressures. OHCRSC also believes that an integrated crop management approach is required for all research so that the impacts and opportunities presented by new technologies are considered. For example, the impact of changes in nutrient management practices have a potential effect on crop quality, pest management, shelf life, etc.

OHCRSC reminds all participants in the research system of the ongoing need to be responsive in the face of rapid and continual change in the horticultural sector.
It is increasingly important that researchers and research funders collaborate and communicate so that their efforts achieve the maximum benefit for the entire industry.

The OHCRSC would encourage OASCC and ARIO to be fully consider changes in staffing and infrastructure at both the federal and provincial level. The cumulative effect of changes at both levels has the potential to have a very serious impact on the horticulture sector.

PCR Diagnostics

Over the next year, the OHCRSC will be establishing a working group in cooperation with OPMRSC to pursue further work on industry needs for PCR diagnostics.

GLP Certification

Over the next year, the OHCRSC will be establishing a working group in cooperation with OPMRSC to discuss coordination of GLP certification of labs, research facilities, field sites and personnel within the University of Guelph, Agriculture and Agri-Food Canada and OMAFRA. It was reported that one producer organization that had put out a call of research proposals had turned down research projects totaling $100,000 because the research sites were not GLP compliant.

Acknowledgements

Many thanks to the members of the executive committee who participated in the annual meeting, conference calls, and actions related to response to recommendations.

I would like to thank each subcommittee chair for the significant amount of time that they have committed to this process in 2001, especially the extra efforts that were undertaken in preparing for the strategic report. Each subcommittee chair has contributed to working collectively with 400+ committee members to set the direction of horticultural research for the next four years.

The support of OMAFRA Innovation and Risk Management Branch has also been significant. Research analysts Stuart Budd and Paul Brine assisted in organizing an April training session and produced a resource package for subcommittee chairs. Their attendance at the fall meetings helped to clarify questions about the OASCC process. Many thanks to Stuart for his support in making sure that the OHCRSC priorities were communicated to other OASCC committees. His extra effort of summarizing the OHCRSC priorities for posting on the ministry website resulted in this information being available to research faculty in time to incorporate into research proposals being developed for the 2002 Plants program at the University of Guelph.

Thanks to Jeff Wilson and Zaher Qadir for representing ARIO at the OHCRSC meeting and adding their perspectives.

A special note of gratitude to Stephanie Staples, Administrative Services Representative, OMAFRA Agriculture and Rural Division for taking on the difficult job of working with many files and different formats involved in compiling this document and maintaining her sense of humour throughout the process.

I would encourage all government, industry and grower organizations to make sure that individuals within your respective organizations are aware of this report. It will be the first step we can all take in collectively looking at what the issues facing horticulture are and how we can work towards solutions to keep moving the industry forward.

Respectfully submitted on behalf of OHCRSC,

Annette Anderson
Chair

INTRODUCTION

The Ontario Horticultural Crops Research & Services Committee (OHCRSC) is one of nine committees (Animal, Field Crops, Horticultural Crops, Food Processing, Rural Development, Agriculture and Food Engineering, Agricultural Economics, Pest Management, Soil Water and Air) reporting to the Ontario Agricultural Services Co-ordinating Committee (OASCC).

The OHCRSC endeavours to compile the thoughts and activities of 16 commodity sub-committees with 2 additional working groups. They are:

Agroforestry
Apiculture & Pollination
Apple
Berry Crops
Crucifer Crops
Ginseng
Grape & Wine
Greenhouse and Protected Crops[1]
Greenhouse Floriculture
Low Acreage & Special Crops[2]
Nursery/Landscape & Turfgrass
Potato
Root, Bulb and Leafy Vegetables
Sweet Corn
Tender Fruit
Tomatoes

Working Groups

1. Mushrooms
2. Asparagus

The membership is made up of industry, government and universities representatives. The main OHCRSC is made up of 14 members with an additional 400 members making up the sub-committees. Horticultural Crops, through its sub-committees, identifies and prioritizes research needs for crop production, including pest management, and makes recommendations to address research gaps, re-allocation of support or re-direction of current research effort.

MANDATE

Main Committee:

- ☐ To review reports submitted by commodity committees.
- ☐ To assess the requirements for horticultural crops research and services.
- ☐ To establish priorities for horticultural crops research and services.
- ☐ To assess progress in horticultural crops research and services.
- ☐ To present reports and recommendations to OASCC describing the needs for horticultural crops research and services including information in relation to:
  - cost-benefit;
  - research and service facilities and personnel required in the investigation(s);
  - location best suited for the investigation(s);
  - how funds might be obtained or freed to conduct new research and services;
  - operation of subcommittees.
- ☐ To consider and approve chairs, vice-chairs and members of subcommittees.

Terms of Reference:

- ➢ To prepare research and service summaries and to recommend research and services priorities in Ontario for appropriate horticultural crops.
- ➢ To disclose problems that face the appropriate industry which require investigations.
- ➢ To coordinate research and services planning and cooperation.
- ➢ To assess and suggest priorities for new programs and recommend which programs presently underway should be expanded or terminated.
- ➢ To estimate, where possible, costs involved in the conduct of new research and services programs and to supply cost-benefit information.
- ➢ To suggest, where possible, how funds might be obtained or freed to conduct new research and development.

OASCC STRUCTURE, DUTIES AND TERMS OF REFERENCE

ONTARIO AGRICULTURAL SERVICES COORDINATING COMMITTEE

A provincial committee, the Ontario Agricultural Services Coordinating Committee (OASCC) was formed in 1965, with four major subcommittees, namely, Field Crops, Horticultural Crops, Livestock, and Soil and Water. Later, four new major subcommittees were added: Agricultural Economics, Agricultural Engineering, Food, and Pest Control. In 1986 "and Services" was added to the names of all the major subcommittees, and two names were changed to reflect more closely the scope of their activities. A new mandate and structure for the Food Research and Services Committee was approved in January 1990, and in 1993 its name was changed to the Ontario Food Processing Research and Services Committee. In 1998-99 OASCC was restructured again to include the following 9 OASCC committees - Animal, Field Crops, Horticultural Crops, Food Processing, Rural Development, Agriculture and Food Engineering, Agricultural Economics, Pest Management, Soil Water and Air.

OASCC

Terms of Reference

1. Regular review of the broad aspects of agri-food and rural research, extension, and education in Ontario with the object of:

a) facilitating intergroup communication and coordination at management levels;
b) assessing immediate and future needs and developing proposals to meet them;
c) advising on joint uses of available facilities and personnel; and
d) contributing information and ideas bearing on regional and national policies affecting agri-food industry.

2. To carry out special assignments on behalf of CARC appropriate to the above objectives.

3. To meet at least annually and to report through a designated representative to the annual meeting of CARC. Summary reports shall be sent to the Chair of CARC with copies to the Deputy Minister of Agriculture, Food and Rural Affairs for Ontario.

ONTARIO AGRICULTURAL SERVICES CO-ORDINATING COMMITTEE

Ontario Animal Research & Services Committee

Aquaculture
Beef
Broiler
Dairy
Deer
Egg Layer
Equine
Fur Bearing
Goat
Pork
Sheep
Turkey

Ontario Field Crops Research & Services Committee

Cereal Crops*
Corn*
Forage Crops*
Oil & Protein Seed*
Pulse*
Tobacco*

Ontario Agriculture & Food Engineering Research & Services Committee

Crops
Food
Livestock
Rural Environment

Ontario Soil, Water & Air Research & Services Committee

Agrometeorology*
Soil Management*
Water Management

* includes technical working groups

Ontario Horticultural Crops Research & Services Committee

Agroforestry
Apiculture & Pollination
Apple
Berry Crops
Crucifer Crops
Ginseng
Grape & Wine
Greenhouse & Protected Crops*
Greenhouse Floriculture
Low Acreage & Special Crops*
Nursery/Landscape & Turfgrass
Potato
Root, Bulb and Leafy Vegetables
Sweet Corn
Tender Fruit
Tomatoes

Ontario Food Processing Research & Services Committee

Dairy Products & Processing
Fruit & Vegetable Products & Processing
Cereal Grains & Oilseeds Products & Processing
Meat Products & Processing

Ontario Agricultural Economics Research & Services Committee

Ontario Pest Management Research & Services Committee

Technical Working Groups
Fruit Vegetables Tobacco & Ginseng Field Crops
Protected Crops Ornamentals & Turf
Ontario Weed Committee

Ontario Rural Research & Services Committee

SUBCOMMITTEE EXECUTIVE SUMMARIES

AGROFORESTRY

Agroforestry has been defined as the wise and profitable incorporation of trees and woodlands into farming systems contributing to sustainable land use. At present, the industry is worth an estimated $80 million to Ontario's economy annually. The industry remains unaffected by supply management quotas. There is considerable opportunity for growth in a number of commodity specific industries including high value timber production, maple syrup and edible nuts. Annual weather can have a dramatic affect on the yields of maple syrup and edible nuts. In 2001, the yield of maple syrup was down significantly in many areas due to unseasonably cool temperatures which resulted in at best "weeping flows" of sap. Nut crop yields were reduced as a result of the drought. The production of timber is influenced by longer –term weather patterns and other factors.

Excellent progress has been made in following up on the year 2001 recommendations of the agroforestry sub-committee and accomplishments are documented in detail in this report. The work activities are diverse because of the broad scope of agroforestry. Work of the University of Guelph, the Ontario Maple Syrup Producers' Association and the Ontario Soil and Crop Improvement association is reported in detail. The Ministry of Natural Resources, the Ministry of Agriculture, Food and Rural Affairs and the Grand River Conservation Authority also provided reports.

In the preparation of the 2001 Report, commodity groups and resource agencies were specifically asked to think strategically about their needs for the next 4-5 years.

Some recommendations for research and service in 2002 and beyond support a continuation of activity which has already been initiated but requires further development. To the extent possible, issues related to global warming, nutrient management, water quality and quantity, food quality and safety, and the reclamation of fragile agricultural lands have been considered in the development of recommendations. Its is recommended that the Agroforestry Research activity recommended by the Department of Environmental Biology, University of Guelph be supported and that aspects of the Ice Storm Recovery Research for the maple syrup industry be extended for a few years. The Environmental Farm Plan and the Maple Seal of Quality Program are important initiatives which need to be supported into the future. There is a need to pursue Minor Use Registrations for insecticides for the nut tree industry and of herbicides for the Christmas tree industry in accordance with the recommendations contained in this report.

A number of emerging issues are outlined in the report. There is a need to develop a comprehensive policy to guide tree planting activity in rural communities in the future. A plant breeding opportunity to incorporate genetic resistance to chestnut blight disease into native Canadian sweet chestnuts has emerged.

In 2001, efforts were made to raise awareness regarding the OHCRSC Report in the forestry community and to broaden membership on the Agroforestry Sub-Committee. The

Grand River Conservation Authority renewed their participation in 2001 after one year's absence.

APICULTURE

The winter of 2000-2001 was not a good one for bees in Ontario. Overall losses were in the range of 25%. This was much higher than the normal 10% that most beekeepers experience. The bees went into winter with small populations of old bees instead of the physiologically young bees that a good honey flow produces. Some beekeepers that pay close attention to all the details of good queens, lots of feed and excellent packing did winter well. For the industry as a whole it meant a spring of recovery for colony count.

The summer produced a short intense flow of very white honey. Strong hives brought in an exceptional crop of clover honey. Many areas then dried out to the point that the colonies did not produce until very late in September when some colonies where they received rain made some honey from Goldenrod and Fall Aster. The provincial average will be over 100 pounds per hive, which is very close to the long-term average for Ontario. The price of bulk honey is averaging about $1.07 per pound which is up considerably from last years price. Beekeepers are moving honey to market this fall!

Beekeepers have been able to supply farmers with required number of bee colonies for pollination. Summer pollination of cucumbers and several other field crops continues to develop.

The varroa mite has continued to spread to almost all areas of Ontario. The tracheal mite has spread to about 40% of the bees. Varroa that are resistant to Apistan have crossed the St. Lawrence River in the Cornwall area. Beekeepers in the area lost several complete beeyards last season. This year they applied Formic Acid spring and fall as well as putting in Apistan strips. A new chemical treatment is required.

Small Hive Beetles (SHB) have not been detected in Ontario. If Choumphos were to be registered, there would be something available for SHB control.

American Foulbrood (AFB) resistance to the only registered product in Canada – Oxytetraclyine is a major concern to the industry.

Beekeepers have benefited from the research efforts of the Tech-Transfer Program administered by the Ontario Beekeepers' Association (OBA). The beekeepers are determined that the Tech-Transfer Program will have longer-term financial sustainability. The Tech-Transfer program has played a critical role in maintaining the beekeeping industry in Ontario in these past seven years. The Integrated Pest Management (IPM) strategy developed by the Tech-Transfer Program has been adopted by more than 70% of the Ontario beekeepers.

Research accomplished by the U of G has helped in developing a sustainable pollination program for field crops and management of pollinators. The initial efforts of the U of G in breeding mite resistant bees and searching to find suitable effective miticides are helpful.

The efforts by OMAFRA personnel and the Apiary Inspection Program have served the industry well during this critical period. The extension campaign to deliver the developed technologies has been excellent.

Beekeepers are determined to work in a partnership with the OMAFRA and other agriculture sectors to keep a healthy beekeeping industry in Ontario. We plan to work on these Apicultural Issues:

1 - Breeding of bees to be resistant to HBTM, Varroa and AFB using the hygienic test, the Quick Test and the SMR test.
2 - Developing IPM for honey bees for Varroa, HBTM, SHB, and Infectious Diseases.
3 - Seek to establish the Tech-Transfer Program for the long term.
4 - Seek to maintain the OMAFRA Apicultural Program at its current level.
5 - Work towards a better understanding of the effects of Imidocloprid on honey bees.
6 - Work towards the registration of Oxalic Acid, Choumphos, Formic Acid, Tylosin and Lincomycin.

We plan to work on these pollination issues:
1 - Machine harvested cucumbers.
2 - Pollination requirements of the new varieties of apples.
3 - Best management practices for pollination.
4 - Develop interest in native pollinators by encouraging provision of nesting materials.

GINSENG

In the spring of 2001, Farm Products Marketing Council conducted a vote to determine support for a ginseng grower check-off. In the fall of 2001, it was announced that the vote carried. This has given the Ontario Ginseng Growers Association the mandate to assess a per/acre fee to all growers and to act as the representative voice of ginseng producers in Ontario. Industry support remains positive and the OGGA has moved forward with the formation of a research committee to address research needs and determine appropriate industry support. The OGGA has produced a bi-weekly newsletter to keep growers informed of market conditions, crop size and quality and current issues. A barrel workshop was organized to demonstrate root quality and buyer preferences. Member producers have committed $40,000.00 of ginseng root to clinical trials conducted by the University of Toronto on the affects of ginseng on diabetes.

The industry continues to face challenges in the areas of production and marketing. Yield-limiting and quality-reducing diseases remain the major factors affecting production. Climate change is emerging as an issue due to the affect of high temperatures on seed set. Site selection has gained importance as more land is leased for ginseng production and soil properties and herbicide residues are playing an increasing role in both yield and quality.

The entry of China into the WTO will have an impact on this crop as over 85% is exported to Asia.

With the organization and mandate of the OGGA , these challenges will be met with a united front and a coordinated effort.

GRAPE & WINE

Over the last 5-7 years there has been a rapid expansion of both acreage planted and infrastructure as a result of large capital investments in all areas of the wine sector. Today, *Vinifera* production now outstrips French hybrid and juice grape production. Over 70 grape based wineries are now licensed in Ontario. Over the last 2 years various industry stakeholders, LCBO and several provincial government ministries have been developing a **20 year strategic plan**. The plan's main goal is to achieve annual retail sales output of $1.5 billion by a **capital investment of about $1.2 billion and almost doubling the acreage of vineyards**. Expansion is required to remain globally competitive.

GREENHOUSE & PROTECTED CROPS

The value of Ontario Greenhouse and Protected Crops in 2001 was $524 M. These crops comprise greenhouse vegetables and mushrooms. A large portion of these crops (70% in the case of greenhouse tomatoes) was exported.

The growth of the outside greenhouse vegetable industry slowed down in 2001; 25 hectares (64 acres) were added in 2001, mostly in the Leamington area. The total area is now estimated at 470 ha (1175 acres) for Ontario (1000 acres in Leamington). In comparison, the entire US greenhouse vegetable industry is estimated at around 850 acres. The 2001 value of all Ontario greenhouse vegetables is estimated at around $360M.
The most critical problems faced by the industry in 2001 were: the tomato trade dispute with the USA, low prices for tomatoes, labor availability, and fast rising energy costs.

Industry needs for new technology and expert advice were in most cases met effectively by a strong research and extension team.

The mushroom working group is divided into two sections: 1) commercial button mushrooms and 2) specialty mushrooms, so as to better hear the needs of each sector of mushroom cultivation. The commercial button mushroom market remains strong with growers anticipating slight increases in production and prices. The industry is expanding in the quantity of spawn run or Phase III substrate that will become available to Ontario growers. This is in contrast to the US mushroom industry, where they continue to use the older technology. Ontario growers see this as a competitive advantage and along with the US/Canadian exchange rate will allow Ontario growers to further compete with the US providing opportunities for expansion. The existing backgrounds of mushroom diseases and flies with the result of occasional outbreaks remain a constant production issue . There is the additional worry what impact the withdrawal of the fungicide Benlate from the marketplace will have on the industry. Environmental issues remain a major concern of the industry both in odour and neighbour problems but waste water issues as well. At least three mushroom operations have committed to using the latest Phase I bunker/tunnel mushroom substrate production technology. Research continues to address the needs of the Ontario mushroom grower.

LOW ACREAGE & SPECIAL CROPS

This strategic sub-committee report identifies issues, prioritizes research and service requirements and makes recommendations to the OHCR & S committee with respect to 15 or more Low Acreage and Special Crops. Based on an approved recommendation in the year 2000, sub-committee report the alium, leafy and Asian vegetable crops were transferred to the renamed Ontario Root Bulb, and Leafy Vegetable Research and Services Committee.

Over the course of the last 5 years, weather conditions and changes in the market place have impacted on production, of low acreage and special crops. In the year's 2001 and 1999 growers experienced an extremely dry growing season while the year 2000 was extremely wet. In recent years the number of buyers and retailers of fresh produce has diminished significantly causing rationalization and consolidation in the industry. Never the less, Ontario's agri-business entrepreneurs continue to investigate opportunities in the pioneering of non-traditional crops, development of innovative production and processing technologies, and tackling the market place.

The viability and expansion of those crops considered Low Acreage and Special is somewhat limited by a number of issues including, 1) nutrient management requirements; 2) food safety; 3) minor use requirements; 4) good lab practice compliance requirements, etc. It is important that research and service priorities and recommendations to OHCRSC committee be acted upon to ensure agri-business viability within Ontario's rural communities during a time of increased global competition.

NURSERY/LANDSCAPE & TURFGRASS

The 2001 growing season was characterized by a mild but very snowy winter followed by an early spring across Ontario. This was followed by the third very dry summer in four years, in contrast to the previous wet summer. The fall, in turn, was milder than normal, with warm temperatures.

A great deal of confidence is currently expressed by industry nursery, landscape and turf industry representatives. This is of course, tied to the improved economy and businesses are cautiously expanding for the future. The farm gate values for nursery stock sales and sod sales that are reported reflect statistics from 2000; and it is expected that 2001 statistics will again reveal a strong increase in the value of these crops (though not necessarily the acreage) devoted to them.

Research programs continued to address industry needs as evidenced by the continuation of projects and the initiation of new research efforts designed to meet stated concerns. The support of service personnel in extension and lab areas is also appreciated and continues to meet industry expectations.

The industry statistics which result from the survey project of Mr. Ken Nentwig (U.ofG./Ridgetown College) will be an important tool for this committee and the industry generally to work with in the future. It is very gratifying to see this kind of successful implementation of recommendations coming out of the work of this committee and its parent committees.

The nursery, landscape and turf industry is involved in its committee and they have an optimistic outlook for the next five years. As mentioned, potential cutbacks or reductions due to retirements are a concern and the industry continues to push for their fair share of research and services. There is the realization that they need to be more actively involved in generating the funds to support research.

POTATO

During the month of November, the Ontario Potato Board held five district meetings where growers discussed research priorities. In addition, responses to a survey developed by the Board and OMAFRA helped the committee to rank priorities.
The fact that there was good grower participation in this important process indicates that the research priorities selected for the 2002-2005 period represent very well the needs of the Ontario Potato Industry
Consumers demands continue to have a tremendous impact on the potato industry, which is reflected in the issues identified by the committee members.

ROOT, BULB AND LEAFY VEGETABLES

The mandate of this committee changed in February 2001, and was accompanied by the change in name from "Ontario Muck Crops Research & Services Committee" to the current name.

The main crop responsibilities of this committee now include: onions, carrots, lettuce, and celery on both muck and mineral soils. Other root, bulb and leafy vegetables (such as parsnip, red beet, garlic, radicchio and spinach) may gain importance on this committee, depending upon grower concerns.

The root, bulb and leafy vegetable sector of the horticultural industry is a progressive industry willing to adopt new technologies and approaches to dealing with the challenges that the industry faces. This sector is proud of the quality of its growers and their produce. The industry is benefited by its close proximity to large population bases, by the low Canadian dollar which is advantageous for exports to the United States, and by soils and a climate that enable the production of high quality vegetable crops.

There is a continuing trend for traditional production areas of onions, carrots and lettuce to become more heavily utilized in the production of Asian vegetables and processing celery, while acreages of the traditional muck crops (in particular, carrots and onions) are increasing on mineral soils. It is believed that total acreages in these crops will remain relatively static over the next 5 year period, but that the number of growers of these crops will likely decrease.

The root, bulb and leafy vegetable sector is willing to embrace new opportunities for value-added products (slivered, diced and frozen onions, carrot juice, etc.), and new niche-market crops (Asian vegetables, nutritionally enhanced vegetables, etc). This sector has the potential to turn current concerns over food safety to its advantage through strategic marketing that emphasizes our ability to deliver high quality, safe produce. However, there is a general concern about who will bear the costs of implementing legislated food safety and nutrient management programs and uncertainties as to whether the requirements of these programs will be suitable for vegetable production.

The progress of the root, bulb and leafy vegetable sector towards these goals is hampered by the erosion of crop scouting IPM programs and by lack of access to new environmentally-friendly, reduced-risk and biopesticide-type products. The industry is thus forced to rely on older organophosphate and carbamate products with less favourable environmental and health profiles. However, competitors, particularly those in the US, have access to these improved products and are governed by different standards for importing their produce to Ontario than Ontario growers must meet. Lack of a political vision for agriculture at both the federal and provincial levels has led to decreased support for the industry, in terms of income protection programs for growers, and support for researchers and research funding. There are jurisdictional inequalities (e.g. Quebec vs. Ontario) in terms of the level of support provided provincially to growers. Growers are frustrated by the NISA system, due to a lack of timeliness in program announcements and payments made to growers. This negatively impacts on the ability of growers to make critical decisions about approaching growing seasons. Due to the lack of credit available from many banking establishments, increasing numbers of growers are using their input suppliers as sources of credit. Government support is critical to the ability of this sector to compete, particularly as it includes a wide variety of crops, many of which are grown on small acreages.

The root, bulb and leafy vegetable sector has been negatively affected by the amalgamation of major grocery chains and by the globalization of the marketplace, which has led to the loss of loyal and reliable markets and to the need to compete with growers from all corners of the world. In addition, the local packing house marketing system used in some regions of the province is unable to adequately stabilize prices and to organize the even distribution and release of produce throughout the year. It is felt that there may be an increasing shift towards grower-packer operations over the next 5 years.

Seven research issues were identified and prioritized in the following order:

1. Minor Use Pesticide Registrations
2. Crop Fertility Issues.
3. Disease Management
4. Integrated Insect and Nematode Management.
5. Development of Integrated Weed Management Programs.
6. Value-added Product Development.
7. Cultivar Evaluations.

There are four recommendations made by the Ontario Root, Bulb & Leafy Vegetable Research & Service Committee in 2001. They are ranked in decreasing priority as follows:

1. Loss of Nematode Research Capabilities in Ontario
2. Dedicated Funding for Nutrient Management Research
3. Modification of the Minor Use Regulatory Process
4. Certification and Maintenance of GLP-compliant Facilities.

TENDER FRUIT

2001 was again a challenging year for the Tender Fruit industry. An extended drought in June, July and August lead to problems with fruit size and maturity.

Surveys for plum pox virus identified additional infected trees, primarily in orchards and areas where the disease had been identified in the 2000 survey. Industry efforts to identify sources of PPV-free budwood outside of the quarantine zone have enabled propagation of trees for future replacements and new plantings. The demand for processing peaches is very high, and the processor is proceeding with plans for new plantings to meet this demand. Of concern is that this year, for the first time, more imported peaches were processed than locally produced peaches.

Important service milestones included the publication of six issues of the *Tender Fruit Grape Vine* newsletter; the Niagara Peninsula Fruit and Vegetable Growers' Association annual convention and trade show at Brock University in Feb., 2001, with some 300 growers in attendance; the distribution of trees of new selections by the Ontario Fruit Testing Association; an international workshop on plum pox virus with attendees from Canada, the USA, Europe and the Australia.

Research highlights include continuing the breeding and evaluation of rootstock and variety/selections presently located at Vineland and Cedar Springs. Tree fruit research at Harrow has now been terminated, with the removal of evaluation orchards, and the transfer of germplasm to the Canadian Clonal Gene Bank. Vineland researchers continue to participate in orchard management trials and many grower/industry/research funded projects (i.e. CanAdapt) were initiated or continued.

The most important issues brought to the attention of the committee included:

- the detection and eradication of trees infected with plum pox virus
- the continued need for increased supplies of peaches and pears for processors, through expansion of the land base for production outside of traditional areas
- the need for fire blight control strategies in light of the future loss of streptomycin
- continued research support for the tender fruit industry through staffing the tender fruit breeding position at the University of Guelph, Vineland Station, and crop protection research positions at Agriculture and Agri-Food Canada, Vineland Station
- establishing and dealing with nutrient management concerns

The committee included pest management discussions and priorities. Most pest management research and extension staff attended the meeting and submitted reports to the committee.

The executive of the committee includes David Hunter, Chair and Wayne Roberts, Vice-Chair and Secretary.

INDUSTRY/SECTOR SCAN

MAJOR ACCOMPLISHMENTS

AGROFORESTRY

Significant Research And Service Accomplishments

University of Guelph - Agroforestry Research Group
Submitted by: Naresh Thevathasan, University of Guelph

Completed Thesis Titles (M.Sc.)

- **Richard Gray. 2000.** Root Distribution of Hybrid Poplar in the Temperate Agroforestry Intercropping System. 116 pp.

Refereed Articles

- **Oelbermann, M and A.M. Gordon. 2000**. Quantity and Quality of Autumnal Litterfall into a Rehabilitated Agricultural Steam. J. Envir. Qual. 29: 603-611.

- **Thevathasan, N.V., A.M. Gordon and G. Price. 2000.** Biophysical and Ecological Interactions in a Temperate Tree-based Intercropping System in Southern Ontario, Canada. p. 49-60. In: Sustaining agriculture in the 21st Century. Proceedings of the 4th Biennial Meeting North American Chapter. International Farming Systems Association. 342 pp.

- **Oelbermann, M. and A. M. Gordon. 2000.** Enhancing Wildlife and Water Quality in an Agricultural Landscape. A Case study of Riparian Buffer Zone Rehabilitation, p. 37-48: In Sustaining Agriculture in the 21st Century. Proceedings of the 4th Biennial Meeting North American Chapter. International Farming Systems Association. 342 pp.

Manuscripts in Preparation to be submitted to Refereed Journals

- **Thevathasan, N.V., A.M. Gordon, G.W. Price and P.E. Reynolds…..** Promoting the Stewardship of Soil and Water Resources through Biophysical and Ecological Interactions in a Temperate Tree-based Intercropping System in Southern Ontario. Canada. Ecosystem (Submitted).

- **Zhang, P. and A.M. Gordon…..** Nutrient inputs through hydraulic pathways and Litterfall in a Temperate Tree-Based Intercropping system in Southern Ontario. Canada.

- **Simpson, J. A., P. Reynolds and A. M. Gordon.....** Competitive Interactions and Their Effects on Maize and Soybean Productivity in a Tree-based Intercropping System in Southern Ontario. Canada.

- **Price, G.W. and A.M. Gordon.** Image Analysis Methodology for Rapid field Earthworm Burrow Estimates in Soil Profiles under a Temperate Poplar Intercropping System. Agroforestry Systems (Submitted).

Abstracts

- **Oelbermann, M., R.P. Voroney and A. M. Gordon. 2000.** Elemental Leaching of Populous spp. Leaves Collected in Litter Traps in the North Temperate Zone. ASA, CSSA, SSSA Meeting, Indianapolis, U.S.A.

- **Thevathasan, N. and A.M. Gordon. 2000.** Intercropping Trees with Crops. Newsletter. Eco-Farm and Garden.

Posters

- **Price, G.W., and A.M. Gordon. 2000.** Special and Temporal Distribution of Earthworms in a White Ash, Silver Maple, Poplar Intercrop in Southern Ontario. Canada. College Royal 2000. University of Guelph.

- **Price, G.W., and A. M. Gordon. 2000.** Effects of Tree-Based Land Use Systems on Earthworm Populations. International Plowing Match. 2000.

2001 References

- **Angers, D.A., R.P. Voroney and D. Cote.** (1995). Dynamics of soil organic matter and corn residues affected by tillage practices. Soil Sci. Soc. Am. J.56:1311-1315.

- **Bezkorowajnyj, P.G., A.M. Gordon and R.A. McBride.** (1993). The effect of cattle foot traffic on soil compaction in a silvo-pastoral system. Agrofor. Syst. 21: 1-10.

- **Dixon, R.K.** (1995). Agroforestry systems: sources or sinks of greenhouse gases? Agrofor. Syst. 31: 99-116.

- **Dixon, R.K., J.K. Winjum, K.J. Andrasko, J.J. Lee and P.E. Schroeder.** (1994). Integrated land-use systems: Assessment of promising agroforest and alternative land-use practices to enhance carbon conservation and sequestration. Climatic Change 27:71-92.

- **Gordon, A.M. and P.A. Williams.** (1991). Intercropping of valuable hardwood tree species and agricultural crops in southern Ontario. For. Chron. 67(3): 200-208.

- **Loeffler, A.E., A.M. Gordon and T.J. Gillespie.** (1992). Optical porosity and windspeed reduction by coniferous windbreaks in southern Ontario. Agrofor. Syst. 17: 119-133.

- **Nair, P.K.R.** (1993). An Introduction to Agroforestry. Kluwer Academic Publishers. 499 pp.

- **Ntayombya, P. and A.M. Gordon.** (1995). Effects of black locust on productivity and nitrogen nutrition of intercropped barley. Agrofor. Syst. 29: 239-254.

- **Oelbermann, M. and A.M. Gordon.** (1999). Autumnal litterfall into a rehabilitated section of an agriculturally degraded stream. J. Env. Qual. (accepted)

- **O'Neill, G.J. and A.M. Gordon.** (1994). The nitrogen filtering capability of carolina poplar in an artificial riparian zone. J. Env. Qual. 23: 1218-1223.

- **Schroeder, P.** (1993). Agroforestry systems: integrated land use to store and conserve carbon. Climate Research, 3: 59-60.

- **Thevathasan, N.V.**, Gordon, A.M., and Voroney, R.P. (1999). Effects of juglone (5-hydroxy- 1,4-napthoquinone) on soil ammonification and nitrification. Agroforestry Systems 44(2):151-162.

- **Thevathasan, N.V. and Gordon, A.M.** (1997). Poplar leaf biomass distribution and nitrogen dynamics in a poplar-barley intercropped system in southern Ontario, Canada. Agrofor. Syst. 37:79-90.

- **Thevathasan, N.V., and Gordon, A.M.** (1995). Moisture and fertility interactions in a potted poplar-barley intercropping. Agrofor. Syst. 29:275-283.

- **Unruh, J.D., R.A. Houghton and P.A. Lefebvre.** (1993). Carbon storage in agroforestry: an estimate for sub-Saharan Africa. Climate Research, 3: 39-52.

- **Voroney, R.P., and Angers, D.A.** (1995) Analysis of the short-term effects of management on soil organic matter using the CENTURY model. Advances in soil science pp. 113-120.

- **Williams, P.A., A.M. Gordon, H.E. Garrett, and L. Buck.** (1997). Agroforestry in North America and its role in farming systems. In: Gordon, A.M. and S.M. Newman (Eds.). Temperate Agroforestry Systems. CAB International, Wallingford, U.K. 269 pp.

- **Williams, P.A. and A.M. Gordon.** (1995). Microclimate and soil moisture effects of three intercrops on the tree rows of a newly-planted intercropped plantation. Agrofor. Syst. 29: 285-302.

- **Williams, P.A. and A.M. Gordon.** (1994). Agroforestry applications in forestry. For. Chron. 70(2): 143-145.

- **Williams, P.A. and A.M. Gordon.** (1992). The potential of intercropping as an alternative land use system in temperate North America. Agrofor. Syst. 19: 253-263.

- **Young, A.** (1997). Agroforestry for soil management. CAB International, Wallingford, UK. 320 pp.

Other Activities

Several tours for delegates from China, Sri-Lanka, Japan and Ghana were conducted in the past year. Also, several field tours for local delegates were also conducted (e.g. CRESTech members, Grand River Conservation Authority etc.)

University of Guelph – Alfred Campus

Lachance, S. 2001. Sanitation and New Gleaning of Maple Tubing Systems. University of Guelph – Alfred Campus

ONTARIO SOIL AND CROP IMPROVEMENT ASSOCIATION

Submitted by: *Andrew Graham, Stewardship Programs Coordinator,*
Ontario Soil and Crop Improvement Association (OSCIA)

Reports Available from OSCIA:

- Environmental Farm Plan Indicator Study. 2000.
  University of Guelph.
  School of Rural Planning and development.

- Restoration of the American Chestnut-Farm Response to a Species at Risk. 2000.
  A Demonstration Project.
  Ontario Soil and Crop Improvement Association.

- Wildlife Impact Assessment for Ontario Agriculture. 2000.
  Ontario Soil and Crop Improvement Association.

- Evaluation of Buffer Projects along Watercourses on Ontario Farms. 2000.
  Ontario Soil and Crop Improvement Association.

The above referenced reports are available from the Ontario Soil and Crop Improvement Association.

Eastern Ontario Model Forest:

Submitted by: *Brian Barkley, General Manager, Eastern Ontario Model Forest*

- Survey of Farmers, Ranchers and Rural Landowners-Attitudes and Behaviours Regarding Land Stewardship 2000. Information Report # 48.

- Introduction to Sustainable Forest Certification. 2000. Information Report #49.

The above referenced reports are available from the Eastern Ontario Model Forest office in Kemptville.

Ministry of Natural Resources

Submitted by: *Eric Boysen, Policy Advisor, Private Land Forestry*
Ministry of Natural Resources

Publications Available:

- Silvicultural Guide for Managing Southern Ontario Hardwoods. 2000. Ontario Ministry of Natural Resources.

Extension Services:

The Ministry of Natural Resources supports many extension courses and workshops geared towards farmers and rural landowners.

A tree marking certificate course is offered annually at the Forest Centre in Dorset (certified tree markers are a requirement on public land.). A southern Ontario version of the tree marking course is offered near Turkey Point Provincial Park to deal with more southern issues. The tree marking training courses are designed to implement the recommendations of the new Silvicultural Guide to Managing Southern Ontario Forests. Tree marking courses are designed to implement the recommendations contained in the manual, which defines proper forestry practices and improve forestry practices.

The Ministry of Natural Resources continues to sponsor or participate in woodlot events such as the Outdoor Farm Show, the International Plowing Match, the Hastings Plowing Match and regional Woodlot Conferences in Kemptville and Trenton.

Individual Stewardship Councils offer local training and workshop opportunities for landowners.

The Forest Gene Conservation Association organized and delivered four seed collection and handling workshops, training about 100 people on proper techniques. Prescribed techniques aim to ensure seed source control and genetic integrity.

Ministry of Agriculture, Food and Rural Affairs:

Submitted by: *Dave Chapeskie, Agroforestry Specialist, OMAFRA*

Publications Available:

The publications are available from The Ontario Maple Syrup Producers' Association - Promotion store.

- High Pressure Boiler Selection for the Production of Maple Products. Coons, C.F. 2001. Ontario Ministry of Agriculture, Food and Rural Affairs. Unpublished Report

- Report on Economics of Maple Syrup Production. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs and the Canadian Farm Business Management Council.

- Effects of Ice Storm Damage and other Stressors on Sugar Bush Health and Sap Productivity-Literature Review and Synthesis. Coons, C.F., 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. ISBN 1-896392-63-6.

- Impact of the 1998 Ice Storm on Sugar Bushes and Summary Management Recommendations. Chapeskie, D. .2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note. ISBN 1-896392-66-0.

- Tapping and Sap Collection Techniques in Ice-Damaged Sugar Bushes. Chapeskie, D. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note. ISBN 1-896392-67-9.

- Harvesting and Maintenance in Ice-Damaged Sugar Bushes. Richardson, M. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note. ISBN 1-896392-68-7.

- Operating to Minimize Ice Storm Impacts on Tree Health. Richardson. M. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note ISBN 1-896392-69-5.

- Protection of Ice-Damaged Sugar Bushes. Richardson, M. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note. ISBN 1-896392-70-9.

- Determining the Nutritional Health of Sugar Bushes and the Role of Fertilization and Liming. Wheeler A. 2000.Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note ISBN 1-896392-71-7.

Ice Storm Survey and Research Information:

- 1998 Ice Storm Maple Producers assistance survey. 2000. University of Guelph.

- International Ice Storm Conference. 2000. Ministry of Natural Resources, Carleton University.

Climate Change Information

- Preparing for climate change: The potential consequences of climate variability and change. 2001. University of New Hamsphire.

Agroforestry Brochure:

- Ontario's Agroforestry Program. Bringing the Resources of the World to Rural Ontario. Revised 2001.

  This brochure summarizes key resources available to farmers and other woodlot owners in eastern Ontario. Important information available on various aspects of agroforestry is described in this brochure e.g. maple industry, christmas tree industry, farm woodlots, windbreaks, shelterbelts and stream buffers. The brochure is updated annually.
  This brochure can be obtained from the Ministry of Agriculture, Food and Rural Affairs.

Study Courses Reviewed:

- Independent Study /OAC ACCESS Course Conserving Woodlands. Hilts, S. 2000. Centre for Land and Water Stewardship. University of Guelph.

- New Agroforestry Curriculum Documents. Moncton University, Edmunston, New Brunswick. 2000.

Maple Agriphone:

- OMAFRA is working to provide farmers with a number of different alternatives to access information related to commodities of interest to them. In 1999, 2000, and 2001 a province wide toll-free phone line was established for maple. During the maple season, maple producers and others can dial in a toll-free line and listen to a short pre-recorded informational message for maple. Emphasis has been placed on informing maple producers on the status of crop production in the different parts of the province. Other messages which pass on production tips and the results of applied research are provided as well. The Maple Agriphone has been popular with maple producers and will be continued in 2002.

Agroforestry Industry Exhibit:

- An agroforestry industry exhibit which high-lights the importance of the agroforestry industry in Ontario was prepared in 2000. The exhibit is has a section for the maple industry and a section for other aspects of agroforestry. The exhibit was used at the International Plowing Match, the Outdoor Farm Show, Annual MNR Stewardship Conference and a number of other meetings in 2000 and 2001. Staffing was provided for the agroforestry exhibit.

Other Agroforestry Activities:

Technical Presentations at Conferences

- Chapeskie, D.J. Maple Production School. 2001. Economics of Maple Syrup Production Cornell University.
- Chapeskie, D. J. Biodiversity in the Sugar Bush. 2001. North American Maple Syrup Council Meeting, St. Cloud Minnesota.
- Lachance, S. 2001. Sanitation and Cleaning of Maple Tubing. North American Maple Syrup Council Meeting. St. Cloud, Minnesota.
- Chapeskie, D.J. Maple Production School. 2000. Maple Orchards in Ontario. Cornell University.
- Chapeskie, D.J., International Ice Storm Conference. 2000. Ice Storm Assistance for Maple Producers and Christmas Tree Farmers in Eastern Ontario. Carleton University.
- Chapeskie, D.J., North American Maple Syrup Council Meeting. 2000. Use of Steam in the Production of Maple Products. Burlington, VT.
- Chapeskie, D.J., North American Maple Syrup Council Meeting. 2000. Sanitation and Cleaning of Maple Tubing. Burlington. VT.

Posters

- Timmer, V., Y. Teng and D. Chapeskie. 2001. Soil Amelioration. Improves Nutrition of Ice Storm Damaged Sugar Maple Stands. North American Maple Syrup. Council Meeting, St. Cloud, Minnesota.
- Coons, C.F. and D. Chapeskie. 2001. High Pressure Boiler Selection for the Production of Maple Products. North American Maple Syrup Council Meeting; St. Cloud, Minnesota.
- Noland, T. 2001. Ice Storm Effects on Maple Sap and Syrup. North American Maple Syrup Council Meeting, St. Cloud, Minnesota.

Maintenance of Agroforestry Website:

A website is maintained with linkages to other important websites (e.g. site of the Ontario Maple Syrup Producers Association). The site address is: http://www.gov.on.ca/OMAFRA/english/crops/hort/agrofore.html.

Extension- Advice and Information:

The Agroforestry Specialists provide technical and promotional support for a number of industry meetings (e.g. OMSPA Summer Maple Tour, OMPSA Local Information Days, SONG Field Trips etc). The Specialists are heavily involved in the packaging of technical information and its transfer to producers and woodlot owners. They also provide advice and information to a wide variety of clients on request.

APICULTURE & POLLINATION

2001 Annual Report

Provincial Apiarist: Doug McRory

A. Beekeeping Industry Statistics

No. of Beekeepers		3400
No. of Producing Colonies		75000
Average Yield/Colony (lbs/kg)		102lbs/46.2kg
Total Estimated Crop (lbs/kgx1000)		7650lbs/3470kg
Colonies Wintered	Current Year	75000
	Last Year	80000
Bee Yards		6200
Selling Permits		135
Moving Permits		5
Queen and Nuc Inspections		504
Total Inspections		902
Orders to Destroy		58

B. Diseases and Pests

Disease/Pest	Colonies Inspected	Disease Positive	Est. Incidence (%)
AFB	7450	204	2.7%
EFB	7450	85	1.1%
Chalkbrood	7450	237	3.0%
Sacbrood			N/A
Tracheal Mite			45%
Varroa Mite			95%
Other	No Small Hive Beetles, no r-AFB		

C. Comments

The winter of 2000-2001 was not a good one for bees in Ontario. Overall losses were in the range of 25%. This was much higher than the normal 10% that most beekeepers experience. The bees went into winter with small populations of old bees instead of the physiologically young bees that a good honey flow produces. Some beekeepers that pay close attention to all the details of good queens, lots of feed and excellent packing did winter well. For the industry as a whole it meant a spring of recovery for colony count.

The summer produced a short intense flow of very white honey. Strong hives brought in an exceptional crop of clover honey. Many areas then dried out to the point that the colonies did not produce until very late in September when some colonies where they received rain made some honey from Goldenrod and Fall Aster. The provincial average will be 102 pounds per hive, which is very close to the long-term average for Ontario. The price of bulk honey is averaging about $1.07 per pound which is up considerably from last years price. Beekeepers moved honey to market in the fall to take advantage of the higher prices!

Beekeepers have been able to supply farmers with required number of bee colonies for pollination. Summer pollination of cucumbers and several other field crops continues to develop in Ontario. 17.9% of beekeepers income was from pollination. The average price received by beekeepers for high-density apples was $62.29 per colony and $47.78 for regular density trees.

The Varroa mite has continued to spread to almost all areas of Ontario. The Honey Bee Tracheal Mite (HBTM) has spread to about 45% of the bees.

Varroa that are resistant to Apistan have crossed the St. Lawrence River in the Cornwall area. Beekeepers in the area lost several complete beeyards last season. This year they applied Formic Acid spring and fall as well as putting in Apistan strips. A new chemical treatment is required. The Bee Inspection Program of OMAFRA in co-operation with the Ontario Beekeepers Association (OBA) Tech-Transfer Program has been testing in the Cornwall area and to date the tests indicate that resistance has started to develop. Reports from British Columbia and New Brunswick indicate that they also have Varroa that are resistant to Apistan. As Provincial Apiarist I have been in contact with Dr. Don Wilson of Bayer who own the next available product - Choumphos - for varroa control. Dr. Wilson had gone as far as possible until either Apistan Resistant Varroa or Small Hive Beetles was detected in Canada. He will now be able to move forward on this issue. Varroa that are resistant to Apistan is a reportable condition under the Federal Animal Protection Act that Dr. Brian Jamison administers in CFIA. The resistant Varroa in Ontario have been reported to Dr. Jamison. We would like to have Choumphos registered now so we could use it in the areas of greatest risk of resistance near the original boarder areas where Varroa first invaded Ontario. We would also use it to alternate with Apistan in areas where Apistan still works to extend the life of the Apistan. We will be testing in the other border areas – Niagara, St Claire River and Detroit River next season.

Beekeepers would also like to see Oxalic Acid available as it is a "softer chemical" to control Varroa. Work is being carried out on Oxalic Acid, which is showing good promise, but a better method of application is still required. Allison Skinner of the OBA Tech-Transfer Program is working in co-operation with Dr. Medhat Nasr on Oxalic Acid. Oxalic Acid would fit into our IPM program for Mite control. We expect that we could use a treatment of Formic Acid spring and fall and just as the bees are wrapped for winter do an effective treatment with Oxalic Acid to protect the bees from Varroa.

The Ontario Bee Breeders continue to select for HBTM resistance through the Quick Test method, Hygienic Behaviour by the Liquid Nitrogen Test and now the new Harbo Suppressing Mite Reproduction (SMR) test. The OBA Tech-Transfer Program with the Ontario Bee Breeders conducts all of these tests. Dr. Tibor Szabo, who has been working on a grant from the OBA, reports that after five generations of selection his strain of honey bees is showing excellent mite reduction. Beekeepers should be purchasing more queens from the Ontario Breeders with good test results and they should also be incorporating some of Dr. Szabo's stock into their bees. This is especially critical in the Cornwall area where resistance is apparent.

Beekeepers and bee inspectors are concerned over what appears to be an increase of American Foulbrood (AFB). Bee inspectors reported that with the few hours that they had available for random inspection they would always find AFB without going very far. Beekeepers themselves are reporting concerns that there is more AFB around than before. 16% in 2000 and 35% in 2001 of beekeepers reported having to deal with AFB in their own bees. Beekeepers need to be looking at more colonies for AFB.

Beekeepers are also concerned about the possibility of oxy-tetracycline resistant American Foulbrood (r-AFB). r-AFB has been found in many states of the USA including New York and Alberta and BC in Canada. The Bee Inspection Program of OMAFRA has been sending samples of any AFB that is found during AFB inspections. To date no r-AFB has been detected in Ontario. As Provincial Apiarist, I have been working with Dr. Don Nelson and Adony Melathopoulos of Beaverlodge Research Station; Grant Hicks of Alberta Beekeepers Association; Dave MacMillian and Heather Clay of Canadian Honey Council; on getting registration of Tylosin (owned by Elanco in Guelph) and Lincomycin (owned by Pharmacia and Upjohn in Orangeville) for AFB control in Canada. We are still awaiting the US data that may be enough to get it registered in Canada. Beaverlodge is doing research also in this area to back up the information from United States. Even though we do not have r-AFB in Ontario we would like these products registered to be able to alternate with oxy-tetracycline and extend the life of it in an Integrated Pest Management Program (IPM).

Beekeepers are also concerned about the possibility of large-scale spray programs for West Nile Virus control. As Provincial Apiarist, I have been in contact with Dr. Gord Surgeoner who sits on the Provincial Committee involved with West Nile Virus. He assures me that we will be involved if any program is developed for aerial application of pesticides. Beekeepers are also concerned about the ongoing problem of Aerial Application of Furadan to Sweet Corn. There were some losses this season again but most beekeepers reported that the colonies involved did recover and the losses were not as severe as two years ago. There were two modifications to the protocol to allow sprayers to use Furadan to spray without notification to the beekeepers if they put it on before the tassel was out of the furl and the time was moved up to 6:00 PM for September and 5:00 PM for October spraying. The OBA Tech Transfer Project did some experiments on covering the entrances of colonies left near fields treated with Furadan. The bees were not working the sweet corn for pollen so there were no bees killed at this site and closing the hives did not detrimentally affect the bees.

Beekeepers are also concerned about the possibility of introduction of Small Hive Beetles into Ontario. The Bee Inspection Program over the last two seasons has trained most of the bee inspectors to recognize this pest. To date no SHB has been reported in Ontario. Beekeepers are encouraged to watch for SHB especially along the boarder areas. If Choumphos were to be registered, there would be something available for SHB control.

Beekeepers are concerned about whither Imidacloprid is causing damage to their bees in Ontario. There seems to be a correlation to high winter losses to beekeepers that have had bees in areas where potatoes or orchards were treated with this product. Everyone is awaiting independent, hard data on the sub lethal effects of this product on the bees. The French beekeepers feel there is a definite problem. It remains to be seen if it can be scientifically shown to be a problem or not in Canada.

We will be adding two recommendations to our list for this next season. We will suggest that beekeepers incorporate an 8*8 mesh screened bottom boards which reportedly gives about 40% control of Varroa mites. The screen needs to have about 1.5 inches of clearance under it. Apparently the mites fall off of the bees on a regular basis. If they are separated from the bees, they will just sit in an ambush position, waiting for a bee to approach and eventually starve to death. The other recommendation will be to put two shallow frames in each standard depth hive. The bees will produce drone comb on the bottom of the frames. Each time the beekeeper visits the hive, they cut off the drone comb. It can be melted for wax. As 80% of the Varroa are attracted to drone brood if it is available, a large number of the Varroa can be removed during the season when colonies normally produce drones. This reduces the pressure in the fall to get a treatment on in time to protect the winter bees.

Beekeepers need to know what is going on with Varroa populations as the season progresses. We recommend two methods of monitoring. The sticky board method involves putting a sticky board on the bottom of the hive for 24 hours with an 8*8 mesh screen over it. After 24 hours with no treatment in the colony, count the mites and apply the following formula – No. Of mites * 200 (represents the number up in the brood for every mite on the sticky board) * 2 (for every two weeks) until you plan to treat. If that total number is anything over 10,000 you need to do a treatment sometime before you had planned. The second method is more accurate. The method is to take a quarter cup of bee's (150) from a hive and shake them in soapy water or alcohol. The beekeeper counts how many mites are on the 150 bees. This is a very accurate way to make decisions about when to treat. In Hivelites (the CHC Magazine) there is an article on how to make a simple Varroa shaker from two plastic containers. This season was very interesting in that the Varroa were at very minimal levels at the end of August 2001. If a beekeeper knows this kind of information, treatments could be delayed if a honey flow was on. If the mite population is high the beekeeper could forgo some honey to protect his bees.

Even with all these potential problems new beekeepers are coming into the business. We expected that the number of beekeepers would be down some when the data was finalized. Some hobby beekeepers are dropping out as they are finding the mite management too demanding but there is an influx of new beekeepers to take their place. As you see from our numbers, the number of beekeepers held its own. The total colony count is down from last year due to the major loss last winter. It is expected that by next season the numbers will be back up to the level of the previous year. With the price of honey being up significantly, the industry is feeling quite healthy!

2001 Report by the Ontario's Beekeepers' Association Tech-transfer program

Alison Skinner and Janet Tam

A. Breeding and Maintaining Parasitic Mite Resistant Honey Bee Stocks:

1. Maintenance of Tracheal Mite Resistant Honey Bees Stocks

In the 2001 season, eleven bee breeders participated in the tracheal mite resistance bioassay. 96 colonies were evaluated for the resistance trait. Bee breeders will be advised to use the top 25% of the resistant lines in their breeding programs. In addition, bee breeders will be advised to test these colonies for hygienic behavior and the Suppression of Mite Reproduction trait.

2. Amalgamation of the Hygienic Trait into the Ontario Bee Stocks

In the 2001 season, nine bee breeders participated in the hygienic testing. 183 colonies were tested using the liquid nitrogen freeze kill method. Colonies which ranked in group 1 (>75% of killed brood cells removed) and group 2 (50 - 75% of killed brood cells removed) were advised to use these colonies as breeders and to test them for tracheal mite resistance and Suppression of Mite Reproduction.

3. Incorporation of the Suppression of Mite Reproduction (SMR) Trait into the Ontario Bee Stocks

A method to select honeybee colonies, which show the Suppression of Mite Reproduction (SMR) trait for varroa mites, was developed by Harris and Harbo (1999). This method was altered in order to incorporate the SMR trait into the Ontario honey bee-breeding program. Frames with tan stage pupa and purple eyes were selected from the test colonies and frozen until examination. Cells were uncapped until 30 cells containing mites were found or until 500 cells were opened, whichever came first.

Suppression of Mite Reproduction is exhibited if a foundress mite is alone in the cell and has not reproduced, if a foundress mite has been entrapped outside of the innermost layer of the cocoon and if a foundress mite has produced only protonymph stage young. The SMR trait will be an additional selection characteristic for the varroa mite resistant honey bee stocks in Ontario. In the 2001 season, four bee breeders participated in the SMR testing. 26 colonies were evaluated for the SMR trait. Bee breeders are encouraged to test stock, which exhibits hygienic behaviour and tracheal mite resistance.

B. Integrated Pest Management (IPM) Program to Control Honey Bee Parasitic Mites:

1. Improving Oxalic Acid Efficacy on Varroa Mites in the fall (Nasr, Skinner and Tam)

Oxalic acid (OA) can be used against varroa mites as a late fall treatment. Colonies, which are treated with formic acid earlier in the fall season or in between summer and fall, will need this OA treatment. Nasr's results in 2000 showed that OA can kill up to 90% of varroa mites in single brood chamber colonies. OA efficacy was reported to be low (about 70%) against varroa mites in double brood chamber colonies. In the 2001 fall season, a method of applying OA in bee colonies with both single and double brood chambers is currently being evaluated in Ontario and New Jersey.

2. Modified Fluvalinate Resistance Test (Nasr, Skinner and Tam)

In general, test results showed that varroa mites are still susceptible to Apistan® in the Guelph area. Results of the test developed by Pettis et al. (1998) showed that mite mortality was significantly different between the 2.5% and the 10% concentrations of Fluvalinate within 24 hours. The modified test showed more consistent results with less variation in comparison to the test by Pettis et al. More testing of mite resistance should be done in areas where a high risk of introducing Apistan® resistant varroa from the US is expected.

C. Honey Bee Pollination:

1. Evaluation of Strength and Health of Colonies Rented for Spring and Summer Pollination

During the spring, 218 colonies belonging to 21 beekeepers were surveyed in apple orchards. During the summer, 66 colonies belonging to 7 beekeepers were surveyed in cucumbers and 30 colonies belonging to 3 beekeepers were surveyed in canola. Colonies were examined to determine the queen status and the number of frames of brood, frames of bees and frames of honey. In addition, the health of the colony was noted i.e., Chalkbrood, Sacbrood and American Foulbrood. Treatments in the colonies were also recorded. These included Apistan® strips, formic acid pads and Terramycin. In general, there is an unacceptable number of weak colonies being rented for pollination.

D. Management Practices to Reduce Pesticide Damage:

1. Best Management Practices - Corn Spray

Twelve colonies were moved near 100 acres of sweet corn north of the London area. This corn received two aerial applications of Furadan. On the morning of the first application, four colonies were closed by placing wet burlap in the hive entrance for six hours, four colonies were closed with wet burlap in the entrance for twelve hours and four colonies remained open. Dead bee traps were used to monitor the bee mortality of each colony. All colonies remained open for the duration of the second spray, which occurred two weeks after the first spray.

Four colonies were moved near 30 acres of sweet corn west of the London area. This corn received a ground application of Furadan. Colonies remained open for the duration of the spray and dead bee traps were used to monitor bee mortality.

Varroa jacobsoni

Infestation levels of honey bee colonies in the fourth year of a breeding program: report for 2000

Tibor I. Szabo and Daniel C. Szabo

Summary

The year 2000 was the fourth year of our breeding program of selecting and breeding honeybees for hygienic behavior and low *Varroa jacobsoni* populations. Unlike in previous years, the natural fall of adult varroa remained at consistently low levels throughout the season. Thirty-two colonies with screened floorboards had 24 h naturally fallen varroa counts of 2.2, 0.7, 0.6, 0.8, and 2.2 mites per colony for each month from May to September, respectively. Twenty-six of these colonies were used for honey production and their mean total varroa count was 1724 in October. The remaining 6 colonies were used for queen rearing and had a mean total mite count of 720. Four of the honey producing colonies were scale colonies, which indicated colony populations of 58824 to 76471 worker bees in July and showed a mean gain of 128.2 kg for the season.

Introduction

There is great pressure on scientists to select and breed honeybees that are resistant to *Varroa jacobsoni*. In pursuance of this goal, Russian honey bees have been imported into the United States (Rinderer et al., 2000), French bees have been introduced into Canada to test them for possible varroa resistance (Otis et al., 2000), and Harbo and Harris (2000) have used free-mated queens to introduce genes for varroa resistance into a population of honey bees.

Since 1997 we have been selectively breeding honey bees for resistance to varroa and our yearly progress reports have been published in the American Bee Journal (Szabo, 1998; Szabo, 1999; Szabo & Szabo, 2000). The results of our fourth year of research are presented in this publication.

Materials and Methods

In 1994 we began observing the effects of *Varroa jacobsoni* on honeybees when we moved colonies to a mite infested area near Kingsville, Ontario (Szabo, 1994). In 1997 we commenced with our current research program of selecting and breeding honeybees for resistance to these mites. Initially we selected six breeder colonies based on our criteria of low mite counts, hygienic behavior, absence of disease, and high bee populations. In following years we used these criteria to choose the best queens from each family for rearing the new generation of queens. One family was eliminated from the program because of poor performance. During July and August of each year, all queens with the exception of the selected breeders and those in apiaries D and E were replaced with new generation queens.

Five beeyards (apiaries A-E) with a total of approximately 100 colonies were involved in the breeding program. Five colonies, representing the five remaining breeder families, were selected as breeder colonies and the majority of the other colonies were managed for honey production. Those colonies not used as breeders or for honey production were made into nurse colonies for queen rearing or were divided into nucleus colonies.

Varroa populations were estimated using the specially constructed screened floorboards as described by Szabo & Szabo (2000). The natural fall of adult varroa onto the floorboard inserts ("sticky boards") over a 24-h period was counted at least once a month. The natural fall of varroa is directly related to, and is a good indicator of, the total number of mites in a colony (Szabo, 1998).

The total number of mites in each colony was determined by applying two Apistan^{TM} strips into the second brood chamber (between the 3rd and 4th combs and between the 7th and 8th combs). The application of Apistan^{TM} occurred at the end of September after the honey harvest except where otherwise stated. Fallen mites and debris were removed at 5 to 10 day intervals over a 42-day period. The removed mites and hive debris was frozen, dried, and weighed. The total number of mites in each colony was estimated by comparing the weight of a 100 mite sample with its appropriate portion of hive debris to the total weight of mites and debris collected over the 42 days.

Colony populations were determined in apiary A by placing four randomly chosen colonies on platform scales. The weights of these colonies were recorded at least twice a day at 08:00 h and at 21:00 h and on certain days at hourly intervals. A colony's morning weight loss as a result of departing forager bees is a good indicator of the colony's population. Since approximately 17-22% of a colony's worker population forages at a time and a one kg loss indicates approximately 10000 bees (Szabo, 1989), the scale colonies' populations can be estimated. Colony populations were estimated in July during the white sweet clover (*Melilotus alba*) nectarflow and in September during the goldenrod (*Solidago spp.*) nectarflow.

Hygienic behavior was determined by pin killing a 5 by 5 cell area of 25 capped pupae. A brood comb was removed from a colony and held above the hive. Brood was then killed using a pin to pierce through each capped cell. The pin was removed leaving only a small puncture hole visible. The 5 by 5 pin killed area was marked with a nail inserted into an empty cell directly above the 25-cell block. The top bar of the frame was marked with a thumbtack and reinserted into its original position in the brood chamber. After 24 hours the brood comb was examined. Colonies were scored based on the number of uncapped and the number of empty cells in the pin kill area. For example, a colony with a pin kill area containing 18 uncapped cells with 12 pupae completely removed would receive a score of 30 out of a possible 50. Care was taken so that observations were done with minimal disturbance to the colony.

Results

The natural fall of varroa from May to September over the past four years is shown in Table 1 and Fig. 1. The year 2000 was the first in which the mean number of naturally fallen varroa remained consistent from May to September. In previous years the mean number of fallen varroa increased from May to September by 16.5, 7.7, and 10.5 times in 1997, 1998, and 1999, respectively.

The "economic threshold" is defined as the population of varroa at which control measures are justified in order to prevent the mites from causing economic damage. Delaplane & Hood (1997) consider the economic or treatment threshold for first year colonies to be over 3000 mites. Table 2 indicates that the varroa population by the end of September did not reach the economic threshold in most of the colonies with one-year-old queens. Nurse colonies had the lowest varroa populations followed by the honey producing colonies and the colonies divided for nucleus production (Table 2). Colony number 2 in apiary A was an exception in that it had a relatively extreme increase in its varroa population. The colony had a below average population and a total 24 h mite fall of 37. The other 26 honey producing colonies in the same apiary had a combined total 24 h mite fall of 67 mites (a mean of 2.6 mites per colony). Because colony 2 was highly infested it was excluded from honey production and received two Apistan™ strips in early September. It was determined that the colony had a total varroa mite population of 9443. The previous generation queens (2 year old queens) in the honey producing colonies in apiaries D and E had naturally fallen varroa counts that were 7.7 and 24.2 times greater than those of the honey producing colonies in apiary A (one year old queens) (Table 2).

Colony populations of four scale colonies were determined by recording the morning decrease in colony weight caused by the departure of foraging bees (Table 3, Figs. 2 and 3). At 10:00 h on the morning of July 7th the mean weight loss of the four colonies was 1.0 kg and on July 11th it was 1.3 kg. The foraging populations were estimated to be a minimum of 10000 to 13000 bees. The mean nectar gain was 4.2 kg on July 7th and 5.8 kg on July 11th. The colony populations were estimated at between 58824 and 76471 worker bees. During the September goldenrod nectarflow, the mean weight loss as a result of the foraging populations measured between 1.2 kg and 3.6 kg (Table 4). However, because of a dearth in nectarflow colony populations were not reflected in colony gains (Table 4). The mean total gain of these colonies for the 2000 season was 128.6 kg (282.6 lbs.).

The hygienic test results for apiary A over the past four years are displayed in Table 5. Approximately two thirds of the colonies are considered hygienic because they uncapped and removed more than 50% of the pin-killed pupae in 24 h. The colonies that uncapped and removed 100% of the pin-killed pupae were used as breeders for queen production. The score of hygienic behavior for bee populations is relative and can only be compared within the same beeyard with colonies tested over the same period of time.

Discussion

The year 2000 was the first year of our research project that varroa populations remained below the economic threshold. No visible signs of "parasitic mite syndrome" (Shimanuki et al., 1994) were evident in the colonies with one year old queens. The low mite averages were very important because they allowed for the delayed application of acaricide and therefore a September harvest of goldenrod honey.

In previous years, the varroa populations increased substantially and the mean numbers of varroa mites were 12044, 5212, and 5160 in September of 1997, 1998, and 1999, respectively (Szabo, 1998; Szabo, 1999; Szabo & Szabo, 2000). Prior to 2000, the visible signs of varroatosis became evident in colonies and beeyards when numerous deformed crawling bees appeared in August and early September. When mite-free colonies were moved into a varroa infested area the mite populations climbed from zero to approximately 10000 per colony in 4 months (Szabo, 1994) with the rate of incoming mites as high as 14 per day (Szabo & Walker, 1996).

At present we can assume that the low mite reproduction rate in our colonies is a result of our consistent selection and breeding. Environment, climate, bee genetics, and the mites themselves all account for variations in the development of varroa populations in honey bee colonies. *Apis cerena* are a naturally resistant host species to varroa. De Jong (1999) reported that European honey bee colonies on an island sanctuary in Brazil have never had to be treated with miticide. However, bees that seem to demonstrate mite resistance in tropical climates are not necessarily resistant in subtropical or temperate climates. Russian honey bees that have been associated with varroa mites for 45 to 100 years continue to undergo selection and breeding for resistance (Rinderer et. al., 2000).

Over the years we have observed that varroa populations were low in nucleus colonies (Szabo, 1998, 1999), colonies with chalkbrood and American Foulbrood, colonies that originated from swarms, and overheated colonies. Suggestions to "withhold mite control measures from one or more apiaries and allow all mite susceptible colonies to die" (Erickson et al., 2000) are unlikely to result in success. Indeed, excessive colony losses would be a very high price to pay for uncertain results. With high numbers of varroa migrating from poor dying colonies to the stronger ones, even the best resistant colonies would likely be destroyed. We maintain that only a consistent and long term breeding program can hope to produce locally adapted resistant stock with mite infestation levels that are below the economic threshold.

Month ⇓ Year ⇒	**1997**	**1998**	**1999**	**2000**
MAY	**1.7**	**5**	**5.5**	**2.2**
JUNE	**5.1**	**2**	**6.8**	**0.7**
JULY	**12.8**	**2.9**	**8.7**	**0.6**
AUGUST	**14.7**	**10.9**	**21.5**	**0.8**
SEPTEMBER	**28.1**	**38.5**	**57.7**	**2.2**
No. of Colonies	**38**	**40**	**40**	**32**

Table 1. The mean number of fallen adult *Varroa jacobsoni* in 24 h as counted from honey bee colonies at the beginning of each month from May to September over a four year period.

Beeyard	No. of colonies	Age of queens (mths)	No. of fallen varroa			No. of varroa/colony		
			Dead	Alive	Mean	Min	Max	Mean
Apiary A, HP	26	12	41	26	2.6	269	4503	1724
Colony 2, HP,E	1	12	25	12	37	N/A	N/A	9443
Apiary A, N	6	1	2	0	0.4	256	1290	720
Apiary B, DFN	11	12	32	23	5	682	4961	2295
Apiary C, DFN	15	12	21	16	2.5	478	6703	2466
Apiary D, HP	10	12 to 24	186	33	19.9	N/A	N/A	N/A
Apiary E, HP	14	24	677	205	63	N/A	N/A	N/A

DFN = colony divided for nuclei production
HP = honey producing colony
N = nurse colonies
E = exception

Table 2. The number of fallen varroa in 24 h and the total number of varroa per colony as recorded in September and October, respectively

7-Jul-00

Time:	7	9	10	11	12	1	2	3	4	5	6	7	8	total:
Temperature (°C):	10	15	18	19	20	22	23	24	27	26	25	22	21	
Weight change (kg):														
scale colony 1	0	-0.2	-0.9	-0.4	0.8	0.4	0.5	0.1	0	0.4	1	1	0.3	3
scale colony 2	0	0	-1.6	0	0.7	1.1	0.5	0.3	0.4	1.2	1.5	1	0.5	5.6
scale colony 3	0	-0.5	-1	0	0.8	0.7	0.5	0.1	-0.2	1.1	1.8	1	0.4	4.7
scale colony 4	0	-0.1	-0.6	-0.4	0	0.4	0.4	0	0	1.2	1.3	1	0.2	3.4
total:	0	-0.8	-4.1	-0.8	2.3	2.6	1.9	0.5	0.2	3.9	5.6	4	1.4	16.7

11-Jul-00

Time:	8	10	11	12	1	2	3	4	5	6	7	8	9	total:
Temperature (°C):	13	22	24	24	25	26	24	27	25	26	24	22	18	
Weight change (kg):														
scale colony 1	0	-1.4	0.3	0.7	0.4	0.6	0.4	0.1	0.5	0.9	0.6	0.9	0.2	4.2
scale colony 2	0	-1.5	0.6	0.9	0.7	0.8	0.3	0.6	0.9	1	1.3	1.2	0.2	7
scale colony 3	0	-1.3	0.5	0.9	0.6	0.7	0.2	0.3	0.7	1.3	1.5	1.2	0.3	6.9
scale colony 4	0	-1	-0.8	1	0.5	0.9	0.3	0.3	0.7	1.2	1.3	0.8	0	5.2
total:	0	-5.2	0.6	3.5	2.2	3	1.2	1.3	2.8	4.4	4.7	4.1	0.7	23.3

Table 3. The hourly weight changes of four honey bee scale colonies during the white sweet clover (*Melilotus alba*) nectarflow on 7 and 11 July 2000.

Date (2000)	Weight Change (kg)*	Scale colony no. 1	2	3	4
6-Sep	Wt. Loss	1.5	1.6	2.2	2.2
	Wt. Gain	1.4	1.3	2	1.2
7-Sep	Wt. Loss	1.6	2.1	2.1	1.9
	Wt. Gain	2.4	2.8	4.2	2.8
9-Sep	Wt. Loss	2.1	2.9	3.6	2.7
	Wt. Gain	1.8	2.2	2.8	2.1
17-Sep	Wt. Loss	1.4	1.2	1.9	1.7
	Wt. Gain	1.8	2.7	2.7	2.3
19-Sep	Wt. Loss	2.1	2.3	3	2.7
	Wt. Gain	2.5	3.3	4.9	3.9

***Wt loss from 08:00 to 13:30 = approximate wt. of foraging bees.**
Wt gain from 08:00 to 21:00 = approximate wt. of nectar collected.

Table 4. Daily weight changes of four honey bee scale colonies during the goldenrod (*Solidago spp.*) nectarflow in September 2000.

		Hygienic*		Non-hygienic**	
Year	No. of colonies	No.	%	No.	%
1997	34	29	85	5	15
1998	38	26	68	12	32
1999	30	17	57	13	43
2000	26	17	65	9	35
Total	128	89	69.5	39	30.5

*** Uncapped and removed > 50% of the pin killed pupae in 24 h.**

*** *Uncapped and removed < 50% of the pin killed pupae in 24 h.**

Table 5. The number and percentage of hygienic and non-hygienic honey bee colonies in one apiary from 1997 to 2000.

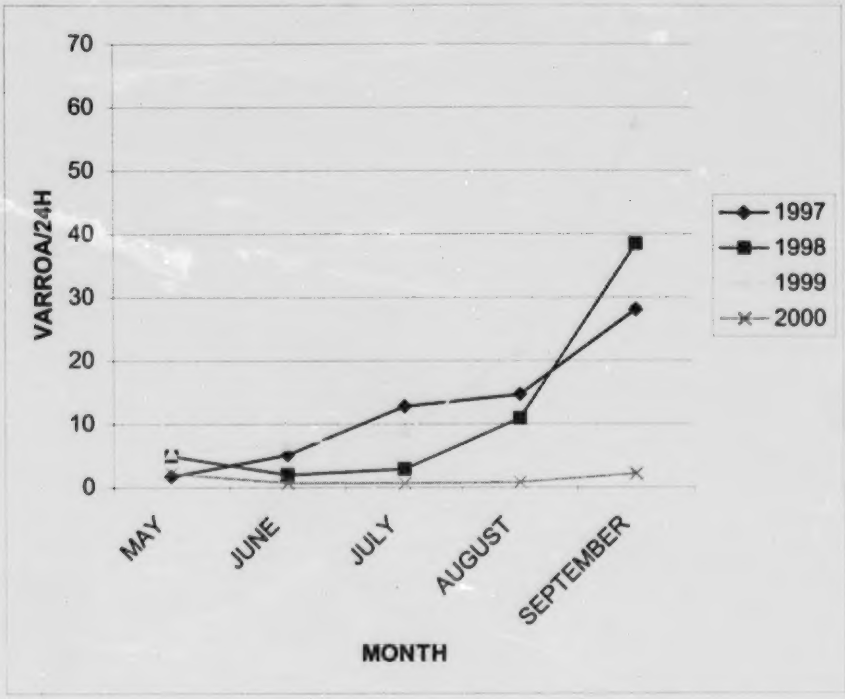

Figure 1. The mean number of fallen adult *Varroa jacobsoni* in 24 h as counted from honey bee colonies at the beginning of each month from May to September over a four year period.

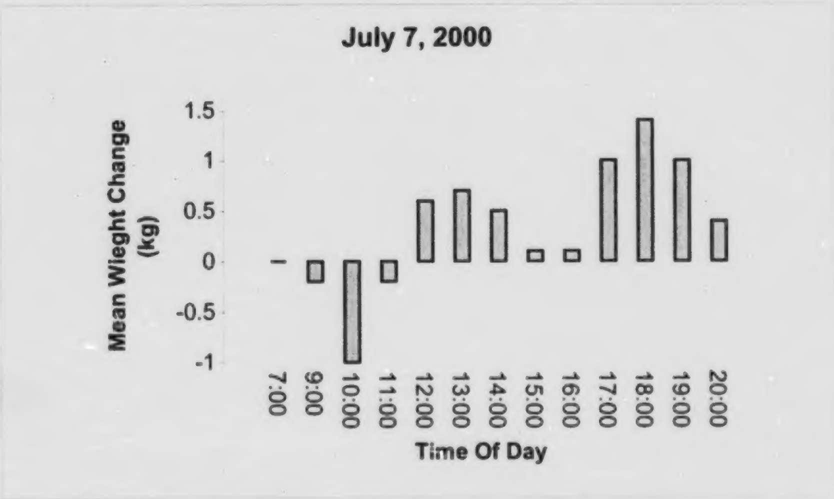

Figure 2. The mean hourly weight changes of four honey bee scale colonies on 7 July 2000.

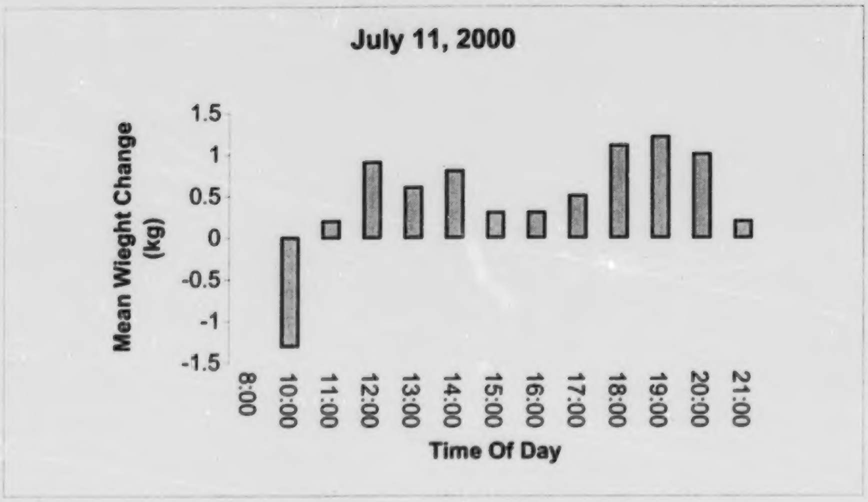

Figure 3. The mean hourly weight changes of four honey bee scale colonies on 11 July 2000.

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Annual Report:

Gard W. Otis, University of Guelph

Overview

This past year I had the heaviest teaching commitment since my arrival at the University of Guelph nearly 20 years ago. Despite that I was able to undertake significant responsibilities relating to beekeeping and apicultural research:

- Initiated a major trial of three alternative varroacides (2 essential oils + amitraz);
- Continued evaluation of resistance to varroa of bees imported from France;
- Initiated collaborative research on storage proteins in winter bees;
- Undertook training of two new graduate students, who initiated research on (a) the timing of drone mating flights, and (b) the effects of pollen shortages on wintering honey bees;
- Coordinated the training of three summer undergraduate assistants;
- Taught a short course on introductory beekeeping (2.5 days, with Paul Kelly);
- Completed the publication of numerous papers started while on sabbatical leave the previous year;
- Made a presentation to the Ontario Beekeepers' Association annual convention in Ottawa, on relative resistance of French and Canadian honey bees;
- Wrote 5 articles for beekeepers, published in The Sting.

In addition, Paul Kelly, my OMAFRA-supported technician who ably manages the Apiculture Field Laboratory (Townsend House), continued to provide support and space to numerous individuals, including:

- Dr. Cynthia Scott-Dupree and Tillie Welsh for testing of an alternative varroacide;

- Geoff Wilson, a graduate student supervised by Dr. Peter Kevan and Dr. Medhat Nasr;
- the Royal Winter Fair;
- Numerous beekeepers' associations through regular presentations.

Together, Paul and I handle several hundred telephone calls from beekeepers and the public about bees and wasps each year.

Research activities

Comparative Resistance of French and Ontario Bee Stocks to Parasitic Mites

Gard Otis, Yves LeConte, Paul Kelly, and Didier Crauser

In summer, 2000, we exported 30 Canadian queens to France and imported 29 French queens to Ontario, in order to compare the relative resistance of these two stocks of bees to parasitic mites. The Canadian evaluation was established under quarantine on Georgina Island, with colonies infested with both tracheal mites and Varroa mites.

Although we have not completed our comparative evaluations, several preliminary statements about the results can be made at present. As was expected, the French bees were not very well adapted to Canadian conditions and many entered last winter with relatively small clusters. Nevertheless, mortality of colonies in the two stocks has remained similar throughout the project. Tracheal mite infestations in samples taken in October, 2000, were higher in the Canadian bees than in the French colonies. Surprisingly, in some French colonies more than 50% of the bees were infested with tracheal mites, which was unexpected given the insignificance of tracheal mites as pests in France in recent years and the long association of bees and tracheal mites in France.

Although these particular strains of French bees do not appear to be negatively affected by Varroa mites in France, in our trial they had Varroa infestations similar (if not slightly greater) than the Canadian colonies. However, one French colony is of considerable interest for future breeding because it has continued to have low varroa mite infestations and gentle behaviour. Before the middle of November, all Varroa mites in the colonies of the two geographic stocks of bees will be killed and counted, to finish the Canadian trial. Results of the French trial are not yet available.

The results of this study are intriguing. In France, bees of these stocks appear to be resistant to Varroa and require no Varroa control measures, whereas the "resistance" disappeared in Ontario. These results suggest that localized co-adaptation of bees and mites may be occurring, making "resistance" a factor that may not always be transferable to new areas that have different strains of mites.

Comparative Resistance of "Resistant" California and "Nonresistant" USA stocks of bees to Varroa

Gard Otis, Zachary Huang, and Adrian Wenner

A phenomenon similar to that reported in France may have occurred in Santa Barbara, California. There, feral honey bees are thriving, suggesting either that the bees have become resistant to mites, or that the bees and mites have evolved a localized non-damaging association. In summer, 2001, queens removed from feral colonies in California were established in ten colonies along with ten other colonies with commercially available queens, in an apiary managed by Michigan State University. The development of Varroa mite infestations will be followed over time to see if the "resistance" observed in California is transferable to other regions.

Evaluation of Three Alternative Miticides

Gard W. Otis, Catherine Cochrane, Gordon Wardell, Sarah McCann, and Paul Kelly

Resistance of honey bees to Apistan (tau-fluvalinate) was reported a few years ago in the USA, and has apparently now been confirmed in New Brunswick. Until bees resistant to Varroa are available, beekeepers will continue to need to regularly treat colonies with miticides to reduce the numbers of Varroa mites. In a large trial involving 75 colonies, we evaluated a commercial formulation of Amitraz currently being marketed in Europe, and two different experimental formulations of essential oils, all contained in plastic strips similar to Apistan strips. Amitraz is well-known to be effective in killing Varroa. Essential oils are known to kill mites in laboratory trials, but efficient delivery systems have been difficult to develop.

This trial is complete, but the results are proprietary information and cannot be released until after they have been given to the companies the developed the miticides and provided funding for the trial.

Storage Proteins in Winter Honey Bees

Gard Otis, Diana Wheeler, Thomas Buck, and Heather Mattila

Diana Wheeler and Thomas Buck (U. Arizona) have made interesting discoveries of special compounds used by insects to store protein for periods in their life cycle when demand for protein exceeds that available from food supplies. I have wondered for nearly 20 years where bees get the relatively large amounts of protein needed for early spring (February-March) brood rearing before pollen is available from flowers in the environment. It has long been known that winter bees have enlarged brood food glands, and some protein is stored in the abdomen (specifically, the fat body and ovary) and blood, perhaps providing pools of protein that may facilitate early spring brood rearing.

To begin to address this question, we wondered whether winter bees have different protein profiles than summer bees. We marked newly emerged bees from two colonies on 1 and 28 September, 2000. From previous studies, we knew that the bees in these groups should have become either all "summer" bees or all "winter" bees, respectively. Ten bees were sampled from each colony at regular intervals (2 d, 4 d, 1 week, 2 weeks, 3 weeks, etc.). The frozen bees were shipped to the University of Arizona for analysis.

Preliminary results have just become available. The newly emerged bees in both groups had similar profiles, with little storage protein present. Within a few days of emergence, the "winter" bees (emerged in late September) had developed large amounts of all known storage proteins (3 separate classes of protein) in the thorax, with only small amounts in the abdomen. In similarly aged "summer" bees from the same hives there was very little of the storage proteins present in the thorax. Finding such large amounts of protein in the thoraces of the winter bees was completely unexpected. By being able to quantify the levels of protein stores in wintering bees, we hope to develop a method quantify the "quality" of wintering bees that have been subjected to different management practices. We expect this to be an interesting future research direction as we explore more fully the amounts of these storage proteins and their utilization by wintering bees.

Heather Mattila, who just initiated her graduate studies, will be focusing her research on various aspects of protein storage, protein shortages, and the effects of pollen dearth on the quantity and quality of bees that colonies rear (see below).

Effects of Fall and Spring Pollen Feeding on Pollen-Stressed Colonies of Bees

Heather Mattila, Gard Otis, Paul Kelly, and Chris Hiemstra

Colonies of honey bees receive suboptimal amounts of pollen when placed in commercial fields of pickling cucumbers. Trapping pollen at the same time should result in colonies with chronically low levels of protein. These management practices may cause the bees in these colonies to be protein deficient, which could affect their winter survival and/or spring brood rearing.

In August 2001, Chris Hiemstra provided 40 colonies from which he had trapped pollen continuously while the bees were pollinating two successive crops of cucumbers. We expected these bees to be protein-stressed going into the winter. The colonies were randomly divided into four treatments: fed pollen patties (2) in the fall; fed pollen patties (2) in the spring, fed pollen patties in both spring and fall; and control colonies that received no supplemental pollen. We will monitor fall cluster size, brood areas in fall and spring, and colony performance in 2002, to determine the effects of this protein shortage on the bees and the relative costs and benefits of supplemental pollen feeding. We expect these results to be helpful to other beekeepers who rent hives of bees for cucumber pollination.

Factors Influencing the Timing of Drone Mating Flights

Gwynne McAneney and Gard Otis

Gwynne McAneney is interested in both basic and applied research. We decided that an appropriate topic for her MSc. degree would involve studies of some poorly understood aspects of the biology of drone honey bees. Specifically, we wondered if there was a way to manipulate colonies of bees so that their drones (and queens) would take their mating flights earlier in the day than the reproductives in unmanipulated colonies. If so, it might be possible to obtain control over mating without resorting to geographic isolation.

As a starting point, we decided to see whether we could shift the timing of drone flight earlier in the day by confining the drones for several days. For the experiment we used 20 colonies of bees, half of which had queen excluders installed for 3 days prior to our observation of drone flights. After removal of the queen excluders, drones were observed taking flights from most of the experimental colonies before noon; very few drones in the unconfined colonies few before noon. A few drones flew from confined colonies much earlier than 10:30 EDT) which is earlier than drone mating flights ever occur naturally. The effect, (e.g., the shift to earlier drone flight times) had largely disappeared by the second day of observation.

Studies in 2002 will focus on the mechanisms that result in this earlier shift in mating flight times. Direct quantification of worker-drone interactions in observation hives before and after confinement will allow us to determine the role of worker bees in shifting mating flights to earlier times. If the result occurs without the involvement of workers, other experiments will be designed to determine the internal mechanism within drones that causes this shift to earlier flights following confinement.

Gwynne will also investigate the relative fitness of large and small drone honey bees. We have designed ways to quantify all aspects of their fitness, by conducting studies in Algonquin Park where we can control all the drones available for mating. In addition, Gwynne has conceived of interesting ways to examine possible competition between sperm from different matings, a topic of current interest by scientists interested in mate competition.

Gard W. Otis: Summary of career, 1999-2001

A. Graduate Supervision

Completed:	8 M.Sc.	2 Ph.D.	1 PDF
In progress:	2 M.Sc.	0 Ph.D.	0 PDF

Name of students supervised within the past three years, title of thesis or project, month and year of first registration and month and year of completion.

- Dawn Bakker (MSc), Foraging and habitat selection by two species of honey bee near Lore Lindu National Park in Sulawesi, Indonesia; Sept. 1997-July 1999
- Gwynne McAneney (MSc), Studies on the biology of drone honey bees. Jan. 2001-present
- Heather Mattila (MSc), Protein status of honey bees and its influence on overwintering honey bees. May 2001-present

B. Publications

C. Life-time summary (count) according to the following categories:

Books authored	1
Chapters in books	6
Papers in refereed journals	52

Papers in refereed conference proceedings	35
Technical reports	15
Abstracts and/or papers read	77
Others (non-refereed publications)	56

*Details of publications for the past 3 years: Chapters in books

Otis, G.W., Kralj, J. "Parasitic brood mites not present in North America," pp. 251-272 in T. Webster and K. S. Delaplane (eds), Mites of the honey bee. (Dadant and Sons, Hamilton, Illinois, 2000)

Papers in refereed journals

1. van Engelsdorp, D.,**Otis, G.W.** The role of cuticular compounds in the resistance of honey bees to tracheal mites. Experimental and Applied Acarology , in press

2. van Engelsdorp, D., **Otis, G.W.**. Field evaluation of nine families of honey bees *(Apis mellifera* L.) for resistance to tracheal mites *(Acarapis woodi* (Rennie)). Canadian Entomologist , in press

3. Palmer, M. R., Smith, D.R., **Otis, G.W.**, Damus, M. (In Press). Genetic markers support the species status of *Apis nigrocincta*. Insectes Sociaux

4. Keeling, C. I., **Otis, G.W.**, Hadisoesilo, S., K. N. Slessor, K.N. Mandibular gland component analysis in the head extracts of *Apis cerana* and *Apis nigrocincta*. Apidologie 32: 243-252, 2001

5. Mattila, H. R., Harris, J.L., **Otis, G.W.** Timing of production of winter bees in honey bee (*Apis mellifera*) colonies. Insectes Sociaux 48, 88-93, 2001

6. van Engelsdorp, D. and **G. W. Otis**. Comparison of spring pollen collection by honey bee (*Apis mellifera*) colonies of Buckfast and Canadian stocks. Proceedings of the Entomological Society of Ontario 131: 133-138, 2001

7. Hepburn, H. R., Smith, D.R., Radloff, S.E., **Otis, G.W**. Infraspecific categories of *Apis cerana*: morphometric, allozymal and mtDNA diversity. Apidologie 32: 3-24, 2001

8. Nasr, M. E., **Otis, G.W**., Scott-Dupree, C.D. Resistance to *Acarapis woodi* by honey bees (Hymenoptera: Apidae): divergent selection and evaluation of selection progress. Journal of Economic Entomology 94: 332-338, 2001

9. van Engelsdorp, D., **Otis, G.W**. Application of a modified selection index for honey bees. Journal of Economic Entomology 93: 1607-1612, 2000

10. Smith, D. R., Villafuerte, L., **Otis, G.**, Palmer, M.R. Biogeography of *Apis cerana* F. and *Apis nigrocincta* Smith: insights from mtDNA studies. Apidologie 31: 265-279, 2000

11. Mattila, H.R., **Otis, G.W.** The efficacy of Apiguard against varroa and tracheal mites, and its effect on honey production: 1999 trial. American Bee Journal 140: 969-973, 2000

12. Mattila, H., **Otis, G.W.**, Daley, J., Schultz, T. Trials of Apiguard, a thymol-based miticide. Part 2. Non-target effects on honey bees. American Bee Journal 140: 68-70, 2000

13. Mattila, H., **Otis, G.W**. Trials of Apiguard, a thymol-based miticide. Part 1. Efficacy for control of parasitic mites and residues in honey. American Bee Journal 139: 947-952, 1999.

14. **Otis, G.W.**, Taylor, O.R., Jr., Spivak, M., Winston, M.L., Katz, S.J., Kukuk, P.F. Timing of mating flights of Neotropical African and European honey bee queens and drones (Hymenoptera: Apidae) in eastern Venezuela. University of Kansas Natural History Museum, Special Publication No. 24: 103-109, 1999

Papers in refereed conference proceedings

1. Jar olimek, J., **Otis, G.W.** In press. A comparison of fitness components of large and small honeybee drones. American Bee Research Conference, Port Deposit, MD, Sept. 2001, American Bee Journal 141:

2. **Otis, G.W.** In press. Facilitated reproductive character displacement in Asian honey bees. American Bee Research Conference, Port Deposit, MD, Sept. 2001, American Bee Journal 141:

3. **Otis, G. W** ., O. R. Taylor, O.R., Jr., Winston, M.L. In Press. Colony size affects reproductive attributes of African honey bees. Proceedings, 2nd Conference on Africanized Honey Bees and Bee Mites, Tucson, Arizona, April 2000.

4. Sm ith, D. R., L. Villafuerte, G. Otis, and M. R. Palmer. In Press. Coevolution of parasites and hosts? *Apis cerana* and *Varroa*. Proceedings, 2nd Conference on Africanized Honey Bees and Bee Mites, Tucson, Arizona, April 2000.

5. **Otis, G.W** ., Hadisoesilo, S., Sugiyani. In press. Using social bees to assess habitat quality in Sulawesi. Proceedings, 7th IBRA Conference on Tropical Bees: Management and Diversity, Chiang Mai, Thailand, March 2000

6. **Otis, G. W.,** N. Koeniger, N., Rinderer, T.E., Hadisoesilo, S., Yoshida, T., Tingek, S., Wongsiri, S., Mardan, M. In press. Comparative drone mating flight times of Asian honey bees. Proceedings, 7th IBRA Conference on Tropical Bees:

Management and Diversity, Chiang Mai, Thailand, March 2000

7. Radloff, S. E., Hepburn, H.R., **Otis, G.W**. In press. Flight machinery of honeybees (Hymenoptera: Apidae, *Apis*). Proceedings, 7th IBRA Conference on Tropical Bees: Management and Diversity, Chiang Mai, Thailand, March 2000

8. Smith, D. R., Villafuerte, L., **Otis, G**., Palmer, M.R. In press. Biogeography of *Apis cerana* and *A. nigrocincta*: insights from mtDNA sequence studies. Proceedings, 7th IBRA Conference on Tropical Bees: Management and Diversity, Chiang Mai, Thailand, March 2000

9. **Otis, G.W**. 1999. Tracheal mite resistance in honey bees: the North American experience, in Proceedings, 36th International Congress of Apimondia, Vancouver, BC, September 1999, pp 63-64

10. Bakker, D., Bakker, A., **Otis, G.W.** 1999. Comparison of foraging and habitat selection by *Apis cerana* and *Apis nigrocincta* near Lore Lindu National Park, Sulawesi, Indonesia, in Proceedings, 36th International Congress of Apimondia, Vancouver, BC, September 1999, p 280

11. Kralj, J., **Otis, G.W**. 1999. Selection of honey bees with rapid development as a component of *Varroa* mite resistance, in Proceedings, 36th International Congress of Apimondia, Vancouver, BC, September 1999, p 264

12. **Otis, G. W**., Hadisoesilo, S. 1999. Insights into honey bee biology from *Apis nigrocincta of* Indonesia, in R. Hoopingarner and L. Connor (eds), Beekeeping in the 21st Century, (Wicwas Press, Cheshire, CT) pp 69-79

13. Bakker, D. R., **Otis, G.W**. 1999. Habitat selection by two species of honey bee, *Apis cerana* and *Apis nigrocincta,* near Lore Lindu National Park in Sulawesi, Indonesia. In M. P. Schwartz and K. Hoogendoorn (eds). Social Insects at the Turn of the Millennium, 13th International Congress, IUSSI, Adelaide, Australia. (Flinders University Press, Adelaide) p 46

14. Mattila, H.R., Harris, J.L., **Otis, G.W**. 1999. The effect of requeening on the timing and rate of production of winter bees in temperate honey bee *Apis mellifera* colonies, in M. P. Schwartz and K. Hoogendoorn (eds). Social Insects at the Turn of the Millennium, 13th International Congress, IUSSI, Adelaide, Australia. (Flinders University Press, Adelaide) p 307

15. **Otis, G.W**. 1999. Comparative distributions of Asian species of *Apis:* Insights into honey bee ecology and biogeography, in M. P. Schwarz and K. Hoogendoorn (eds). Social Insects at the Turn of the Millennium, 13th International Congress, IUSSI, Adelaide, Australia. (Flinders University Press, Adelaide) p 356

Abstracts and/or papers read

1. **Otis, G.W**., Careless, P., Anderson, J., McKenzie, N., LeBrun, K., Malcolm, A., and Lonsdale, O. 2001. Social facilitation by mudpuddling *Battus philenor* butterflies. Entomological Society of Canada and Entomological Society of Ontario, Oct. 21-24, 2001, Niagara Falls, Ont.

2. Mattila, H.R., **Otis, G.W.** 2001. Potential utilization of dog-strangling vine (*Vincetoxicum rossicum* [Kleopov] Barbarich) as an oviposition site by the monarch butterfly (*Danaus plexippus*). Entomological Society of Canada and Entomological Society of Ontario, Oct. 21-24, 2001, Niagara Falls, Ont.

3. **Otis, G.W**. 2001. Facilitated reproductive character displacement in Asian honey bees. American Bee Research Conference, Port Deposit, MD, Sept. 8

4. Jarolimek, J., **Otis, G.W.** 2001. A comparison of fitness components of large and small honeybee drones. American Bee Research Conference, Port Deposit, MD, Sept. 7

5. Mattila, H, Harris, J., **Otis, G.** 2000. Timing and rate of production of winter bees in temperate honey bee (*Apis mellifera*) colonies. Entomological Society of America and Entomological Society of Canada, Montreal, Quebec, Dec. 3

6. **Otis, G.W.**, Makvandi-Nejad, S., Mattila, H., Khalegi-Moghadam, H. 2000. Effects of queenlessness and queen mandibular pheromone (QMP) on comb construction by honey bees (*Apis mellifera* L.) Entomological Society of America and Entomological Society of Canada, Montreal, Quebec, Dec. 3

7. **Otis, G.W.** 2000. Facilitated reproductive character displacement as an evolutionary force in insects. Entomological Society of Ontario, Sault Ste. Marie, Ontario, Oct. 28

8. Makvandi-Nejad, S., **Otis, G.W.** 2000. The influence of honey bee queen status on comb construction. Entomological Society of Ontario, Sault Ste. Marie, Ontario, Oct. 28

9. **Otis, G.W**., Taylor, O.R., Jr., Winston, M.L. 2000. Colony size affects reproductive attributes of Africanized honey bees. 2nd International Conference on Africanized Honey Bees and Bee Mites, 10-12 April, 2000, Tucson, Arizona

10. Smith, D.R., **Otis, G.**, Villafuerte, L., Palmer, M.R. 2000. Coevolution of parasites and hosts? *Apis cerana* and *Varroa*. 2nd International Conference on Africanized Honey Bees and Bee Mites, 10-12 April, 2000, Tucson, Arizona

11. Keeling, C.I., **Otis, G.W**., Hadisoesilo, S., Slessor, K.N. 2000. Mandibular gland components in head extracts of *Apis cerana* and *Apis nigrocincta*. 7th IBRA

Conference on Tropical Bees: Management and Diversity, March 19-25, 2000, Chiang Mai, Thailand.

12. **Otis, G. W.**, and many others. 2000. Comparative drone mating flight times of Asian honey bees. 7th IBRA Conference on Tropical Bees: Management and Diversity, March 19-25, 2000, Chiang Mai, Thailand

13. **Otis, G. W.**, Hadisoesilo, S., Sugiyani. 2000. Using social bees to assess habitat quality in Sulawesi. 7th IBRA Conference on Tropical Bees: Management and Diversity, March 19-25, 2000, Chiang Mai, Thailand

14. Radloff, S.E., Hepburn, H.R., **Otis, G.W.** 2000. Flight machinery of honeybees (Hymenoptera: Apidae, *Apis*). 7th IBRA Conference on Tropical Bees: Management and Diversity, March 19-15, 2000, Chiang Mai, Thailand

15. **Otis, G.W**. 1999. Tracheal mite resistance in honey bees: the North American experience. 36th International Congress of Apimondia, Sept. 12-17, 1999, Vancouver, B.C. (invited)

16. Bakker, D., Bakker, A., **Otis, G.W.** 1999. Comparison of foraging and habitat selection by *Apis cerana and Apis nigrocincta* near Lore Lindu National Park, Sulawesi, Indonesia. 36th International Congress of Apimondia, Sept. 12-17, 1999, Vancouver, B.C.

17. Kralj, J., **Otis, G.W.** 1999. Selection of honey bees with rapid development as a component of *Varroa* mite resistance. 36th International Congress of Apimondia, Sept. 12-17, 1999, Vancouver, B.C.

18. Bakker, D. R., **Otis, G.W**. 1999. Habitat selection by two species of honey bee, *Apis cerana* and *Apis nigrocincta,* near Lore Lindu National Park in Sulawesi, Indonesia. In M. P. Schwartz and K. Hoogendoorn (eds). Social Insects at the Turn of the Millennium, 13th International Congress, IUSSI, Adelaide, Australia. (Flinders University Press, Adelaide) p 46

19. Mattila, H.R., Harris, J.L., **Otis, G.W**. 1999. The effect of requeening on the timing and rate of production of winter bees in temperate honey bee *Apis mellifera* colonies, in M. P. Schwartz and K. Hoogendoorn (eds). Social Insects at the Turn of the Millennium, 13th International Congress, IUSSI, Adelaide, Australia. (Flinders University Press, Adelaide) p 307

20. **Otis, G.W**. 1999. Comparative distributions of Asian species of *Apis:* Insights into honey bee ecology and biogeography, in M. P. Schwarz and K. Hoogendoorn (eds). Social Insects at the Turn of the Millennium, 13th International Congress, IUSSI, Adelaide, Australia. (Flinders University Press, Adelaide) p 356

Non-refereed Publications

1. **Otis, G.W.** The American Bee Research Conference, 2001. The Sting 19 (5), 21-25.
2. **Otis, G.W.** How "natural" is beekeeping? The Sting 19 (4): 20-21, 2001
3. **Otis, G.W** . Protein and bee quality. The Sting 19 (3): 12-13, 2001
4. **Otis, G.W** . Varroa mite diversity: why it matters. The Sting 19 (1): 19-21, 2001
5. **Otis, G.W** . Managing the small hive beetle. The Sting 18(6): 31-32, 2001
6. **Otis, G.W** . Importation of potentially "varroa-resistant" honey bees from France. Hivelights 13 (3): 6-7, 9, 2000
7. **Otis, G.W** . Africanized honey bees: the tenth anniversary. The Sting 18(5):17-19, 2000
8. **Otis, G.W** . Successful wintering of honeybee colonies infested with mites. The Sting 18 (4): 20-22, 2000
9. **Otis, G.W** . The OMAFRA/University of Guelph Bee Research Program. The Sting 18 (3): 20-21, 2000
10. **Otis, G.W**. Recent activities (February-March, 2000). The Sting 18 (2): 8-9, 2000
11. **Otis, G. W**, Bakker, D. Honey hunting in the Philippines. American Bee Journal 140 (6): 477-480, 2000
12. **Otis, G. W**., Hadisoesilo, S., Wardell, G. Homemade queen cages in Sulawesi, Indonesia. Beekeeping & Development Sept./Oct. 2000, No. 56: 4-5, 2000
13. Kralj, J., **Otis, G.W**.. Practical selection to breed bees with rapid development to enhance resistance to Varroa mites. American Bee Journal 139: 191-193, 1999
14. Mattila, H., **Otis**, G.W. Trials of Apiguard, a thymol-based miticide for the control of Varroa and tracheal mites. Hivelights 12: 9-11, 1999
15. **Otis, G.W**. What is a sabbatical leave? The Sting 17 (4): 6, 1999
16. **Otis, G.W**. Beekeeping in Canada. Asian Apicultural Association Newsletter, Supplement No. 8 (May): 8-12, 1999

Presentations to Beekeepers

Paul Kelly and I speak to every beekeeper meeting to which we are invited. Over the last three years these include:

- Presentation (invited) to the OBA annual convention, Ottawa, November 2000 about importation and evaluation of potentially mite-resistant bees from France.
- Presentation (invited) to OBA summer meetings, 1999 and 2000
- Presentation (invited) to Apimondia'99 International Beekeepers' meeting, Vancouver about breeding bees resistant to tracheal mites
- Presentations (invited) to Eastern Apicultural Society:
  1999: Hambleton Award Winner, address, Tennessee
  2000: presentation on French bee importation, Maryland
  2001: presentations on Asian honey bees and bee breeding
  workshop (with Sue Cobey),
  Massachusetts
- Talks to more than six regional Ontario beekeepers' associations; we always respond positively to requests.

Towards Farming Woodnesting aculeates

Peter Hallett, Departments of Physiology and Zoology, University of Toronto

Introduction

Linear nests with consecutive cells separated by transverse walls. Mass provisioning. Species groups characterized by nest borewidth nest construction and provisions. Appealing beneficial insects that are traditionally studied, often destructively, with opaque, widely scattered, trapnests.

AIM New method for observation and propagation.
Demonstrations of scope.
Farming trials as next step.

Methods

Major: Concentration of trapnests in hives---
Instead of being scattered across the field the trapnests are concentrated in one place which saves precious time.
Observation nest blocks---
blind-ended U-section grooves,
transparent tight lids.
can be examined in the field or under a dissecting microscope or passed around a student audience.

Minor: Hive stands on greased poles.
Handy size nest blocks.
Restricted spread of parasitoid *Melittobia*.

Results

1. Method (Feb) & carpentry (June). *Amer.Bee J.* (2001) vol. ***141*** (Feb & June).

2. Demonstrations of scope. Yields (March). Exemplar field trial (May) *Amer. Bee J.* (2001) vol. ***141*** (March & May).

3. Spatial analysis of hive & nestblock use in 2001 near completion (ESC & ESO JAM, Niagara, Oct. '01).

Discussion

1. Plenty of undergraduate, graduate or high school projects to advance the possibility of farming of solitary bees and wasps.

2. Wish to proceed in 2002 to manufacture and field trial for a mass nesting method that uses disposable materials.

A comparison of Russian, Harbo, Ontario and hybrid stocks of honey bee stocks for Varroa Resistance and Economic Factors

Geoff Wilson, Medhat Nasr and Peter Kevan - University of Guelph

Introduction and Objectives:

With the expanding range of varroa mites resistant to miticides, the search for bees resistant to these mites has become more important. Both the Russian honey bee and bees expressing the suppression of mite reproduction trait have promised to deliver some resistance, but little is known about the economic characteristics of this bee. It is the scope of this project to determine the degree of resistance found in the Russian lines of honey bees and the economic characteristics associated with using these bees.

Accomplishments in 2000-2001:

Establishment of Stock in Ontario

In addition to the importation of three lines of Russian bees in 2000, three new lines of Russian bee stocks were imported from New York, USA to Ontario on June 2, 2001. Grafts were also made from the Russian lines introduced to Ontario the previous year. Currently all 6 lines of Russian honey bees released by USDA-APHIS are established in Ontario. All Russian lines to be used for stock maintenance were mated in an isolated mating yard to ensure pure-bred Russian queens. Harbo queen lines were imported at the same time as the Russian queen lines in 2001, inseminated and introduced to colonies. All importation procedures were approved by CAPA, CHC and CFIA Health Canada.

Establishment of the Experiment

To produce 4 different lines of bees for the experiment, Russian and Ontario queens were mated in the isolated mating station to Russian drones and in a mating yard near Guelph, to Ontario drones. The hybrids and pure line queens for the experiment were introduced to colonies June 20, 2001.

Comparative Study of Mechanisms of Varroa Resistance in Russian, Harbo, and Ontario Bee Stocks

Hygienic Behaviour

Russian, Ontario and hybrid stocks of honey bees were tested for hygienic behaviour using the freeze killed pupae assay as described by Nasr (1999). The data are being analyzed.

Grooming Behaviour

Sticky boards were placed into hives for 24 hours on two consecutive days. Mites were removed from the sticky boards and inspected for damage. Mite damage was separated into damage to the body and damage to the legs. The data are being analyzed.

Epidemiological Studies of Host-Parasite Population Dynamics

Population levels of Varroa mites and honey bees were taken throughout the summer. The population of adult bees and capped pupae were determined. Mite population levels were determined on the adult bees and in the brood. Population dynamics data are being analyzed.

Suppression of Mite Reproduction (SMR)

Frames of brood, with tan stage pupae, were removed from brood chambers of Russian, Harbo, Ontario, and hybrid colonies before treatment with Apistan®. Pupae are currently in storage to be analyzed for SMR during the winter.

Economic Characteristics of Varroa Resistance in Russian, Harbo, and Ontario Bee Stocks

Queen Acceptance and Early Supersedure

Queen acceptance and early queen supersedure was monitored for all queens from all lines, including queens used for stock maintenance. Queen acceptance and early supersedure data are being analyzed.

Defensiveness Testing

Russian and Ontario stocks of honey bees were tested for defensiveness using the Novoa-Guzman test. No stings were received during the test. The test will be modified next field season to improve detection of defensive behaviour.

Winter-Ability

Colonies were weighed and bee population determined before going into winter. In the spring the colonies will be re-weighed and population will be determined again. This data will be used to determine the winter-ability of the different stocks of honey bees.

Quick Test for Tracheal Mites

Frames of brood were removed from test colonies and entered into the quick test run by the Ontario Beekeeper's Association. The results of the quick test are being analyzed.

Future Plans for 2002

Commercial Beekeeper Evaluation

Lines of Russian honey bees are being evaluated by 3 Ontario and 2 Saskatchewan beekeepers. Comparisons will be made between Russian and their own stocks for economic characteristics. The commercial evaluation by beekeepers will help in determining the acceptability of the stocks to be used in commercial operations in Canada.

Continuation of the Epidemiological and Economic Traits studies.

It is essential to continue following the population dynamics of bees and mites in 2002 season. Additional economic and resistance characteristics need to be examined in the next field season.

Needs for the project

Financial support is needed to continue the research for 2002.

Acknowledgments

Food Systems 2002
Eastern Apiculture Society
Ontario Beekeepers' Association
Saskatchewan Beekeepers' Association
Canadian Bee Research Fund
Participating commercial beekeepers in NY, Ontario, and Saskatchewan

Report to Apiculture and Pollination Subcommittee:

P. G. Kevan,

The highlight of the year, 2001, was the nomination of the University of Guelph (through me) from the OBA, endorsed by all the grower groups with whom I have been working for the last 4 years, for the Synergy Award. The Award is a prize from The Natural and Sciences Research Council of Canada and the Conference Board of Canada of $25,000 and will be bestowed at a special awards banquet in Montreal on 20 November. I extend my special and heart-felt thanks to all that have supported me in this, and in the research I have accomplished over the last two years.

Research accomplishments over the last two years have been as follows:

1. Research on pollination of **greenhouse tomatoes** by bumblebees was completed in 2000 jointly with Prof. T. Laverty, U of Western Ontario, London and our graduate student Lora Morandin. Lora graduated with her M. Sc. and is now studying for her doctorate at Simon Fraser University.
Her excellent dissertation has resulted in 3 papers so far published and (2) are in press (1). One or two more papers are expected from the work, which has been highly practical and concerns efficiency of bumblebee pollination and the effects of various greenhouse cover

plastics with different transmission spectra. No OMAFRA funding was made available, nor requested for this research.

2. Research on **apple pollination** (top pollination priority of this committee last year) was finished this year (2001) without additional funding. OMAFRA funding for this work was last obtained for the 1999 field season. The results have been published in two major publications in applied horticulture and biotechnology. The upshot of the research is that pollen from various apple cultivars varies in its capacity to sire seeds, some pollen is "stud" pollen and other seems less potent. Nevertheless, pollen does not move more than about 5 - 7 rows across orchards, and, unexpectedly, even less far along rows. There are major negative effects of cross-pollen movement in single cultivar blocks, but to some extent these negative influences can be mitigated by providing larger numbers of honeybee colonies for pollination. This mitigation drops exponentially (more or less) as block size increases.

A particularly exciting finding (tentative) is that apples with multiple-sires for their seeds are bigger and better than apples with the same numbers of seeds by sired by only one pollinizer. This result is novel to science and has major implications to production of high quality apples and orchard design. Funding to continue this work, requested through the OMAFRA contract to the U of G was refused on the basis that industry funding was denied (in truth, it was not asked for in 2001). One reason being the change in research support policy by the Apple Commission, which now has been disbanded. Because the proposal was the same (in truth, it was not) as submitted the previous year (also not funded even when industry money was obtained).

Evidence was not found to support the ideas of within-hive bee-to-bee pollen transfer being part of apple cross-pollination.

4. Pollination studies on **pickling cucumbers** were discontinued in 2001 because of the refusal of the OMAFRA contract to the U of G to support the application. It was included as the top priority for pollination funding for this year by last year's committee. There remain a number of unanswered questions. Although the research would seem simple, the complexities arise because, under Ontario conditions, the sex ratio of flowering has been highly skewed towards male flowers. Thus, there is plenty of pollen for pollination. The cucumber plants, under optimal conditions, should produce only about 30% of the number of male flowers that they have been. With such reduced sex ratio and lessen amounts of pollen, the pollinator forces, at least distant from the hives, may be insufficient to effect maximum pollination. Given the circumstances presently in Ontario, it seems that acreage is being planted to relatively non-productive pollinizer vines (cultivars).
Modest funding to continue this work, requested through the OMAFRA contract to the U of G was refused on the basis that industry funding was denied (in truth, it was not asked for 2001). Because the proposal was the same (in truth, it was not) as submitted the previous year (also not funded then even when industry money was obtained).

5. Research on pollination on **pumpkins and squash** continued to show the value of the hoary squash bee as the major pollinator. A number of general media articles have resulted

from this work talks to grower groups, and an article in *Fruit & Vegetable Magazine* (January 2001). Funds for the 2001 season were not requested. This project has been recognized by the North American Pollinator Protection Campaign as exemplary of the potential for pollination conservation in agricultural ecosystems.

Conclusion:

The pollination program has been highly productive in its scientific accomplishments and efforts in outreach to growers. The program has received global and national recognition for excellence. The details of those accomplishments are not presented here because OMAFRA has not been instrumental in this progress. (The OMAFRA support for bee disease and selection research also conducted from my laboratory under highly competent co-supervision with Dr. Medhat Nasr of the Ontario Beekeepers' Association **is** acknowledged).

It appears that it remains unlikely that future funding for pollination will be obtainable through the OMAFRA program at the University of Guelph. The incorrect reasoning given for denial of funding for the 2001 season and OMAFRA's continuing disregard for the recommendations of this committee, indicate that OMAFRA has little interest in funding research on crop pollination. Moreover, restricted access to the OMAFRA-funded Apicultural facilities at the University of Guelph to assist in crop pollination and other research by my team, has required increasing reliance on private sector support, in-kind and financial, and on other sources of research funding (e.g. NSERC-AAFC-Industry, NSERC Research Grants, NRC-IRAP, Synergy award for 2002 season, private growers, etc.).

Thus, without explicit request to apply for OMAFRA support for 2002, coupled with assurance of modest and "string-free" access to Apicultural and other facilities on campus, I do not intend to apply for research funds in the area of crop pollination under the OMAFRA-U of G program.

APPLES

Many of the historical service components to the Apple industry provided by government employees in the past have been largely taken over by private consultants and organizations like AIMS of the Ontario Fruit and Vegetable Growers Association. In Ontario, there are more than a dozen private consultants providing such services as orchard monitoring, issuing regular recorded audio messages during the growing season, and looking after soil and tissue analysis.

A core group of program leads and specialists in the Ministry continue to provide resource material, support and developmental programs for service providers. Much of the research and trial work is done in cooperation with all industry stakeholders.

- The Ontario Apple Team includes John Gardner (Chair) (Crop Management) , Dr. Jennifer DeEll (post harvest physiology and fruit quality) Margaret Appleby (IPM Systems), Kathryn Carter (Apple IPM), Leslie Huffman (Weed Management and Web Content), John Henderson (Food Safety Risk Management), Dr. John Cline (Cultural research).

- Restructuring of information on the **Website to include Apple** as a stand alone Topic with significant content additions including several new infosheets and series (Leslie Huffman, Margaret Appleby)
  Included this year:
  -Cultivar Descriptions of Ambrosia, Cameo, Chinook, Creston, Enterprise Gingergold, Goldrush, Honeycrisp, Silken
  -Estimating Bin Requirements
  -Using Reflective Mulches
  -Cover Crops
  -Organic References

- New on the OMAFRA website was a series started on **radio reports** for apple and related topics (John Gardner, Apple Team).

- Apple **Industry at a Glance** (Stats and Facts) describing a variety of statistical information was also updated and modified on the OMAFRA site (John Gardner, Siva Mailvaganam and Crosby Mitchell).

- Regional Testing of newer apple cultivars and **advanced AAFC selections** form BC program– Simcoe, Cedar Springs, Georgian Bay (Dr. John Cline, John Zandstra, Ken Wilson)

- Ontario wide **cultivar adaptation trial** with the Apple Growers of Ontario in cooperation with OFTA. This project is in some jeopardy as those cooperators involved were selected through and supported by the now defunct OAMC otherwise known as the AGO or Apple Growers of Ontario (8 sites) – (John Gardner, Margaret Appleby). The trees in this trial are maturing and should provide some good data in 2002.

- Two **thinning trials** on Gala and Empire to look at timing of sprays in relation to fruitlet size and environmental conditions influencing efficacy of treatments (John Gardner, Dr. John Cline). Based on these experiment and others of a similar nature we have largely modified the thinking with regards to thinning apples. The window of opportunity for application of thinners appears to be much wider than once thought for many cultivars.

- Trials looking at the performance and handling of **'Surround' Crop Protectant** on Empire, McIntosh and Crispin apple (Hannah Fraser, John Gardner, Bernt Solymar)
- Testing of the influence of **reflective mulches** on sugar development, size and colour of Fuji and McIntosh culitvars. (John Gardner) Reflective foil laid in early September under mature McIntosh trees sprayed with retain resulted in a rapid change in red color

of lower canopy fruit. After a period of 2-3 weeks sugars increased by 1-1.5 ° Brix in lower canopy fruit.

- Quarterly publication of the **Orchard Network Newsletter**- Ontario Apple Team and associates. Emphasis is on original and leading edge information for the commercial producer in Ontario. Available on the net. Articles are now separated and categorized for web publication.

- Studies on the potential use of **1-MCP** for enhancement of apple quality in the post harvest period (Dr Jennifer DeEll). Several cultivars have been looked at and limitations thoroughly described regarding the effects.

- Prediction modeling for storage quality and **breakdown potential** of apple cultivars The **predictive modeling** uses weather data to determine probabilities (Dr Jennifer DeEll) of keeping quality for apple cultivars with known problems.

- Three **apple thinning workshops** held this past spring in Ontario in Cooperation with N.M. Bartlett (John Gardner). Total attendance was close to 80 producers. Discussed were the factors contributing to failure and success with thinning programs. Cultivar specific information was emphasized with focused discussion on the effects of frost injury and thinning response.

- Development and **strategy** proposal for **OFM** in apple based on serious infestations in the Niagara, Essex and Norfolk areas in 2001.(Kathryn Carter, Margaret Appleby, Hannah Fraser).

- Mating disruption control for **Dogwood borer** in high density plantings on M9 rootstock tested this past season at six locations across Southern Ontario in Cooperation with Larry Gut @ MSU (Bernie Solymar, Hannah Fraser)

- Scheduled Conference Calls during the growing season with private consultants and advisors serving the apple industry in Ontario (Margaret Appleby, Kathryn Carter)

- International **IPM Conference** organized and promoted (Margaret Appleby). This Conference is expected to attract several hundred participants with the objective of Reviewing strategies, successes and planning for the future of IPM.

- Organization and Presentation of related information on food safety regarding the production of unpasteurized **cider at a school** in **Woodstock** during August of 2001. Representatives from 35 cider operations attended as well as several provincial and federal government employees. Request have been made for a hands on sanitation workshop for 2002 (John Henderson).

- During the fall 2000 a province wide inventory of all **cider producers** was completed. A total of 144 apple cider producers were visited and evaluated. The completion of this inventory along with a qualitative risk assessment completed by program staff were prerequisites for the development of the cider baseline study being completed this fall. 52 unpasteurized apple cider producers with a production volume of app 1.5 million litres are in this program.

- A representative number of samples of **cider** (600 to 700) are being collected by OMAFRA staff and submitted to the lab for micro testing. Samples of water and swabs from the production area are also being collected and tested. The information collected by this study should accurately characterize the apple cider industry in Ontario and will be used to assess and develop programs to manage any food safety risks (John Henderson)

- Publication 360 "**Thinning and Growth Regulators**" chapter has been significantly modified to include new information with regards to absorption of thinners and timing of thinning sprays. (John Gardner, Dr. John Cline).

- Other updates in **Pub 360** include sections on pollination and fruit set , rodent and deer control, and all the related recommendations on crop production from a IPM perspective (Apple Team- Margaret Appleby, Kathryn Carter, Pam Fisher, Leslie Huffman & program leads Hannah Fraser ,Cristoph Kessel)

- A new technical reference has been developed for **pruning and training of apple**. This reference has been designed to give a more in depth look at specific cultivars and their needs. Special attention has been given to a variety of training systems (Should be available in 2002)- (John Gardner, Ken Wilson, Dr. John Cline)- reviewers included members of the Ontario Apple team

- Participation in **Fire Blight Workshop** (9th International) in Napier, New Zealand Oct/01 reported in Tender Fruit and GrapeVine Vol. 6 Issue 2, Nov/Dec 2001. (Dr. David Hunter and Dr. Antonet Svircev) Reported that with the exception of oxolinic acid, gentamycin, and resistant cultivars and rootstocks, none of the alternate control measures are as effective as streptomycin where the *E.amy lovora* bacteria are not resistant to streptomycin.

- **OBLR** trial work continues with emphasis on management of resistance and mating disruption. Efficiency of trapping has been improved by 50% by adding a previously unknown volatile to the pheromone mix for attracting OBLR adults. (Dr. Mitch Trimble, Dr. Dave Pree, Margaret Appleby)

- Screening of rootstock for **winter hardiness** and **fire blight resistance** under eastern Ontario growing conditions. (Dr. John Cline and Margaret Appleby)
- Acquisition and cataloguing of newer **apple germ plasm** for the clonal gene bank at Harrow (Margie Luffman).

- Bio control of **blue mold** and **gray mold** on apples using 4 isolates of naturally occurring *Pseudomonas syringae.* Research Treatments of known concentrations of this bacterium were as effective as chemical treatment with a combination of thiabendazole and diphenylamine. (Dr. C. L. Chu et al.).

- Studying the effects of **ozone** in reducing the levels of ethylene in apple and pear storage to non-detectable levels. This work explored the potential use of ozone application in wholesale storage rooms where ethylene producing and **ethylene** sensitive fruits and vegetables may be stored together.(Dr. C. L. Chu, Lisa Skog)

- Work is progressing on the transformation of apple M9 and M26 rootstocks to get them to turn on the **resistance factor** to provide protection **against fire blight bacteria**.(Antonet Svircev, Dan Brown)

- Survey and preliminary work on **various molds** found in the **post harvest** period on Empire apple in the Norfolk area. Occurrences are alarmingly high. (Dr. Deena Erampalli)

- Evaluation of bacterial formulations (**bacteriophages**) as biocontrol agents. Tendency to be only partially effective and relatively costly. Included in this group are Blightban (*Pseudomonas fluorescens* A506), *Pantoea agglomerans* (formerly *E. herbicola* C9-1, *Bacillus subtilis* (Serenade) (Antonet Svircev, David Hunter)

BERRY CROPS

Agriculture and Agri-Food Canada (AAFC)

Greenhouse and Processing Crops Research Centre, Harrow

Canadian Clonal Genebank. *Margie Luffman*
The Clonal Genebank maintains a large collection of small fruit germplasm. This includes strawberry, raspberry, gooseberry, currant, elderberry and blueberry. Both named cultivars (primarily Canadian) and indigenous species are maintained. All accessions are held in protected culture and some of these have been propagated and established in the field for evaluation. Evaluations are done on various horticultural traits and fruit characteristics. Germplasm is distributed freely for research and breeding purposes.

University of Guelph

Department of Plant Agriculture, Guelph

Raspberry Breeding. *A. Sullivan*
The raspberry breeding program has been developing high yielding winter hardy selections to benefit Ontario growers and consumers. Fruit quality has been a primary focus during

the crossing and selection program. Eight selections have been in observation and yield trials at Cambridge, Ridgetown, Simcoe, ON and Kentville, NS. One selection 88-117d has consistently performed well. It has large firm fruit with good shelf-life. Canes are vigourous and resistant to winter injury at the locations tested. Yields have been as good as less winterhardy cultivars. New crosses have been made to improve winterhardiness and take advantage of new cultivars with large firm fruit.

Strawberry Biotechnology and Germplasm Development. *A. Sull ivan*

A. Biotechnology has been used to make some significant advances in strawberry genetics. An *Agrobacterium* mediated transformation system was developed for strawberry cultivars adapted to Ontario. Procedures were established for the successful culture, gene transfer and selection of transformants of the cultivar Startyme. Startyme was bred by University of Guelph researchers and is an ideal platform for such research because of its many desirable characteristics. The *gus* gene was successfully expressed in plant tissues. This technology is waiting to be fully exploited when genes are available that could add value to our popular cultivars. Once a gene has been successfully expressed in Startyme, it could be transferred to the other cultivars using traditional breeding methods.

B. To facilitate the transfer of genes between wild and domestic species of strawberry the synthetic octoploid system was enhanced using chromosome doubling and tissue culture techniques for embryo rescue. Species at the diploid, tetraploid and hexaploid levels were hybridized to produce synthetic octoploids capable of crossing to Ontario's strawberry cultivars. For the first time germplasm from several accessions of 6 strawberry species is available for strawberry breeding and development. This diverse new germplasm is expected to contain genes for disease resistance, growth habit, fruit colour and resistance to environmental stress. Several genotypes with unique flavour components and high levels of vigour have been identified. This germplasm is being integrated into the cultivated strawberry as part of a large collaborative effort with breeders at two US universities. A crossability study is underway to determine strategies for optimum integration of this material. To date, 200 synthetic octoploids have been produced.

C. A study to determine the genetic potential of adapted and unadapted strawberry cultivars in a breeding program is being assessed using diallel analysis. Parents were chosen from strawberry cultivars adapted to California, Pacific Northwest, Europe and Northeastern Canada to assess heterotic patterns. Results indicate strong general and specific combining ability for yield between California and Canadian cultivar combinations. Cultivars with high potential for breeding programs are being identified and some progeny from the crosses warrant further testing.

Genotype by Environment Interaction. *A. Sullivan, J.P. Prive (AAFC), W. Yan, S. Khanizadeh (AAFC)*

During our long history of research with fall-bearing raspberries we have studied the physiological basis of genotype by environment (G x E) interaction. Using current and historical data, statistical models have been employed to quantify G x E. Fall-bearing raspberry cultivars have been rated for yield stability along with the ability of various environments to provide an accurate characterization of yield using different models including biplot analysis. Genotype by environment interaction is also being measured using several selections from the AAFC breeding program at St. Jean, Quebec. Great emphasis has been placed on post-harvest fruit quality (i.e., firmness, colour and shelf-life). Selections with excellent shelf-life in Ontario and Quebec warrant further testing in Ontario. Fruit are large, firm and attractive and should hold great appeal for growers and consumers.

Raspberry Trellising Trial. *A. Sullivan, J. Van den Heuvel and J.T.A. Proctor*
The interaction between trellising system and cane density was tested in Ontario growing conditions. Three trellising systems (hedgerow, V-trellis and shift-trellis) over four cane densities (9, 16, 23 and 30 canes m^2) were evaluated on the raspberry cultivar Titan.

The V-trellis system improved yields by 20% compared to the hedgerow system. The shift trellis system is not adapted to red raspberry production systems with a) vigorous growth and b) primocane and floricanes growing at the same time. Cane density can be increased to improve yield. The physiological basis for the yield improvement in the V-trellis was better light penetration and cane stabilization. Positioning of the canes into a V-formation allowed more light to penetrate into the canopy. More fruitful laterals were formed and there was a reduction in competition between fruiting and vegetative canes. In a separate experiment, the impact of cane stabilization during development was measured. Staking wind-stressed fruiting canes greatly increased yield per cane (68% to 189%) by increasing fruit number and leaf area per cane. Canes that were wind-stressed produced 140% more ethylene than staked canes.

Strawberry Flower Initiation/Row Cover Trial. *A. Sullivan*
Flower bud initiation (FBI) in strawberry occurs during the fall under short day lengths. The flower buds set during this period represent 100% of the yield potential measured during harvest in June the following season. This period becomes critical to optimize yield and can be influenced by climate during the fall period. Floating row covers have been used to increase temperatures close to the soil surface. This change in microclimate would impact both rate and duration of flower bud initiation. In this research, floating row covers were applied at weekly intervals during September and October, the months for very active flower bud initiation. Temperatures under the row cover were on average 3 to 5°C higher than air temperature. When averaged over all cultivars, row covers increased yields by 23%. The yield increase was attributed to an increase in berry number which is consistent with a longer duration of flower bud initiation. Based on an average yield of 8,000 quarts per acre, a grower could expect a yield increase of 1,000 qts or $1,600 per acre.

Department of Plant Agriculture, Simcoe

Strawberry Breeding. *Adam Dale, Dragan Galic, Becky Hughes and John Madill*
Two new varieties, Sapphire and Serenity have been released, Sapphire will be available to growers this coming spring and Serenity in 2003. One selection, 32R14 is being propagated for a one acre block to be planted in 2002 to test its yield potential. One selection, 67K74, are being propagated for release at a later date, provided its propagation rate is satisfactory .

Three selections, 2V112, 25V151 and 46V137, have been propagated for provincial- wide trials in 2002. Another nine selections are in the first stage of field propagation for trials and seven selections, including two day-neutrals) have been micro propagated for field propagation. Ninety-five selections were made in this year's seedling blocks. Twenty-three of these were winter-hardy selections made at New Liskeard and Kemptville, 41 early- producing selections, 25 *Fragaria virginiana* and six day-neutral were made at Simcoe.

Resistance to Tarnished Plant Bug in Strawberry. *Adam Dale, Rebecca Hallett, Skye Campbell and Dragan Galic*

Tarnished plant bugs can cause large yield losses in strawberries, particularly on dayneutrals. Two hundred cultivars, selections, *Fragaria virginiana* genotypes and *F. virginiana* hybrids, were planted in a study to identify genotypes that were tolerant to tarnished plant bugs. Initial results from the first year indicate a large variation in the tolerance to plant bugs. Very good tolerance was found in 21K74 (7% damage), Evangeline (7% damage), two *F. virginiana* x *F. chiloensis* hybrids FV4-90 (5% damage) and FV148-5 (8% damage)and a number of *F. virginiana* genotypes. One *F. virginiana* genotype, Eagle2, had less than 1% damage. Insect monitoring suggested that there was a uniform plant bug population throughout the experiment.

Raspberry Production in Greenhouses.*Adam Dale*

In dormancy-breaking tests completed in we have been able the dormancy of Nova and Tulameen without inducing floral initiation. To do this plants were taken from the greenhouse in August, chilled for six weeks below 7□C, and then returned to the greenhouse. Three-years of trials, to study ways to modify the yield performance by tipping canes in summer and submitting them to a chilling period have been completed. These tests indicate that tipping in summer delays yield but does not increase it.

Highbush Blueberry Irrigation x Variety Trial. *Adam Dale and Dragan Galic*

Total yields from seven harvests of the cultivar x irrigation experiment have shown a large interaction between annual yields and irrigation demand treatments. Yields for the daily irrigation treatment were the lowest at the start of the experiment and have been the highest for the last four years, whilst the tensiometer and WISP model treatments started off as the two highest treatments and have been the two lowest treatments for the last three years. The results suggest that the evapo-transpiration treatment which uses about 25% of the water used in the daily treatment, would be acceptable as a recommended treatment.

Department of Plant Agriculture, Vineland

Alternative Methods to Fumigation for Sustainable Strawberry Production.*Maria Derkacz*

Soil fumigation is the only currently available method for controlling root lesion nematodes. Since this method has a negative effect on soil ecology, alternative ways have to be found. Previous research indicated that organic amendments with specific C:N ratio may provide an effective tool in eradicating the pest without the detrimental effect on soil microbiology. Sandy loam soil with nematode population above 1000/kg of soil was amended with a mixture of chicken manure and paper mill sludge at 7 tonnes per hectare of each (C:N ratio 15:1). There was a significant reduction of the number of nematodes in the amended soil. However, the initial growth of strawberry plants was reduced. In addition, a new organic nematicide originating from mustard seeds is being evaluated as a potential replacement of the traditional chemical fumigants.

Nutrient Management for Improved Strawberry Production. *Maria Derkacz*
The objective is to determine the effects of foliar nutrient applications and calcium nitrate fertigation on strawberry growth, fruit yield and fruit quality. Liquid fertilizers with potassium, calcium, boron or zinc were applied to two commercial strawberry fields with cultivar Jewel grown under a matted row system (Simcoe and Beamsbrook) and one commercial strawberry field with cultivar Chandler grown under a plasticulture system (St. Catharines). The treatments were applied in three week intervals between fruit set and fruit harvest. Applications of the liquid fertilizers resulted in the increase of those nutrients in the leaf tissue. However, some damage to the leaves was observed in cultivar Jewel as a result of spraying with the nutrients. Particularly plants that were treated with a mixture of all four nutrients were damaged significantly. There was no negative effect of the treatments on Chandler strawberries. In addition, Chandler strawberries were fertigated with calcium nitrate at two times in June and in August. The data on yield and plant growth is being evaluated.

Kemptville College

Management Trials. *Wendy Asbil and John Madill*
A straw mulch comparison trial was established in 1999 and will continue through spring 2002. The objectives of this trial are to evaluate alternatives to wheat straw for winter protection, weed suppression and impact on disease and insect incidence. Flax, millet, sorghum, wheat, switchgrass, rye and soybean straws are applied in November and plots are assessed for winter survival of strawberries, ease of raking straw into row, disease and insect occurrence, visual weed assessments by species, weed density by species, strawberry plant appearance, days to flowering, days to bearing, runner production and fruit yield.

In November 2001, two new mulch trials will be established. One experiment will evaluate the impact of mulch depth and the other will focus on the effects of time of mulch application and removal on crop performance and weed, insect and disease pests.

In 2000 and 2001, the herbicide Blazer was evaluated across several strawberry varieties. In 2000, the product was applied to a new planting and in 2001, a one year-old planting received the treatment. In 2000, control of the broadleaf weeds at the site (lamb's quarters, redroot pigweed, stinkweed and chickweed) was good with the 1X rate of Blazer and excellent with the 2X rate. There was some leaf crinkling and spotting on leaves but new growth was unaffected.

In 2001, no treatment caused significant strawberry injury. New growth, including daughter plants, was unaffected. Slight leaf wrinkling and spotting were the only symptoms observed. Given the extremely hot and dry conditions at and following application, it is likely that the Assist surfactant may have contributed more to plant injury than the Blazer. Injury was less for Blazer applied alone at twice the highest rate with Assist. Mira, Winona and Seneca seemed to be more sensitive than the other varieties. Common mallow, volunteer alfalfa, quackgrass and shepherd's purse were the dominant weeds in the field. All Blazer treatments burned the leaves of alfalfa and mallow but, as expected, no treatment provided full control. Shepherd's purse plants that had not flowered were adequately controlled by all Blazer treatments. Older plants escaped.

In 2000, a trial with different between row and within-row spacings was established to assess the effect of this spacing on weed, disease and insect incidence. In general, as spacing decreased, there were fewer and smaller weeds in the plots. During the growing season of 2000 and 2001, there was no difference in disease or insect incidence among spacings.

Several herbicides, rates and timings are under evaluation for purple loosestrife management in growers' fields. Trials were set up in the summer of 2001 and will continue through 2003.

A stand of pearl millet was established for nematode control. A herbicide trial to control weeds in establishing pearl millet was initiated in that stand. The influence of the herbicides on millet performance, millet-nematode interaction and residual effects on strawberries will be investigated.

Strawberry Variety Trials. *John Madill*
A strawberry variety trial of recent releases and numbered varieties was established in 2000. Yield distribution was recorded in 2001 along with berry sized distribution. As in previous years results will be summarized for growers. The trial has been maintained for further results is 2002.

Strawberry Breeding Nursery. *John Madill*
Fifteen lines of strawberries from the Simcoe breeding program were space planted at the Kemptville site in the year 2000. No straw was applied in the fall in order to put additional pressure to select for hardiness. Selections were made in 2001 by the plant breeder. All early lines were initially identified and then 9 selections were made during fruiting time for row planting observations and duplicate trials established at the Simcoe station. Yield and berry size observations will be made in 2002.

New Liskeard Agricultural Research Station (NLARS)

Berry Crop Observation Trials. *B. Hughes and C. Keith*
A total of 26 selections and 15 strawberry cultivars were compared in observation trials for yield and quality in 2001. Additional strawberry selections from the Quebec breeding program were planted in 2001. Nine raspberry selections and four cultivars were planted in 2001 as part of the Ontario Coordinated Berry Crop Trials.

Breeding Winter-hardy Strawberries. *B. Hughes and A. Dale*
16NL11 is currently in trials at 5 grower sites across northern Ontario. Fourteen selections were made from over eight hundred seedlings planted in 2000. The seedlings were the result of seven crosses made between New Liskeard and Simcoe parents. The selections were propagated and planted in observation trials at New Liskeard and Simcoe for yield and berry size observations in 2003. Evaluation of the five New Liskeard selections made in 1995 and 10 selections made in 1998 continues in 10-plant plots.

Strawberry Micropropagation. *B. Hughes and W. Cook*
The SPUD Lab maintained 32 strawberry selections for the Department of Plant Agriculture in Simcoe. Eight new selections were put into culture in 2001 and 8 selections were shipped to Simcoe for establishment for virus testing. Three selections, 67K74, Sapphire (53M54) and Serenity (32R11), moved into the Plant Propagation Program for propagation and release.

Cedar Springs Research Station, Ridgetown College

Weed Control in Strawberry. *F. Tardif and J. Zandstra*
Trials to identify and evaluate herbicides for minor use registration on strawberries continues at Cedar Springs. Dual, Frontier, Prowl, Blazer, Reflex, Goal, and Select are presently being evaluated on the variety Kent. Yield data was collected on trials planted in 2000.

Strawberry Variety Trials. *J. Zandstra*
A coordinated observation trial, which was established in 2000, was harvested in 2001. This trial contained Lacadia, Yamaska, Winona, Brunswick, Seneca, Sable, Mesabi, Evangeline, Latestar, Mira, 6 numbered selections from Quebec, and Kent, Veestar, and Governor Simcoe as standards.

Raspberry Variety Trials. *J. Zandstra and A. Sullivan*
Summer bearing observation trials which were established in 1997 were fruited for the third year in 2001. This trial contains numbered selection from New Jersey (2), New York (1), Guelph (8), as well as Tulameen, Qualicum, Malahat, Nova, Glen Magna, Glen Ample, and Lauren. Nova and Glen Ample were the most productive in 2001, but Gel 20 has the highest cumulative 3 year average yield. Glen Ample and Tulameen have the highest average berry size.

A fall-bearing observation trial which was established in 1998 and 1999 was fruited for the second time in 2001. This trial contains Autumn Britten, Autumn Bliss, Polana, Anne, Carolyn, Heritage, Goldie, Kiwi Gold, JEF-F1, MBT-F1, and NO-1, and Prelude. The highest yielding cultivars up to 05 October were Autumn Britten and Autumn Bliss.

A replicated summer bearing variety trial containing new Guelph selections was established in 2000 and fruited in 2001. Numbered selections include 88-18B, 88-020, 88-17D, 88-46A, 88-134, 88-107, with Boyne and Nova as standards. 88-134 was the highest yielding selection, with yields similar to Nova, while all Guelph selections demonstrated higher fruit quality than Nova and Boyne

Evaluation of Cover Crops and Reduced Tillage Systems for Weed Suppression in Strawberries. *J. Zandstra, F. Tardif, J. O'Sullivan, L. Huffman, P. Fisher, and A. Verhallen.*
Planting strawberries into untilled and zone-tilled rye using a commercial Holland transplanter with a factory-supplied tool bar worked very well. The untilled rye crop provided 4 times the residue by weight and 2 times the ground cover when compared to commercial tillage. Strawberry plant development, as determined by leaf surface area, dry weight, and runner development, did not differ across tillage treatments. The untilled rye cover crop suppressed weed development up to 15 weeks when compared to convention tillage. Weed species development was dependant upon tillage treatment; lambsquarters and purslane were more common in tilled plots, while sandwort was more common in untilled plots. Sinbar suppressed weed development up to 5 weeks after application; activity was poor due to dry conditions. No interactions were found between herbicide (Sinbar) and tillage treatments.

Significant Service Accomplishments

Agriculture and Rural Division, OMAFRA

Demonstrations and Field Projects:
1) Coordinated On-Farm Berry Trials. *Pam Fisher, Berry Crop Specialist, OMAFRA, and Jennifer De'Ell, Post Harvest Program Lead, OMAFRA*
Adam Dale, Becky Hughes, John Zandstra, John Madill, Alan Sullivan, University of Guelph
Twelve strawberry varieties were planted at 19 grower sites and 4 University of Guelph sites in 2000. Growers were encouraged to record yield and 50-berry weight from 1-m plots. Approx. 6 good data sets were obtained from growers in addition to 3 grower's plots harvested by OMAFRA students. Post harvest quality was evaluated on day 1 and day 6 from the latter three sites. Mesabi and Brunswick showed most promise in 2001. High yields were produced from 81RT9 but more information is required.

An assortment of raspberry selections (up to 17) were planted at 5 grower sites and 8 strawberry selections were acquired and distributed to 20 grower sites in 2001.

2) CaSO4 to Control Red Stele of Strawberries. *Mic hael Celetti, Plant Pathologist, OMAFRA Christoph Kessel, Horticulture Crop Nutrition Program Lead, OMAFRA*
To evaluate the effectiveness of gypsum applied as a soil amendment before planting on incidence of red stele in strawberries. A site with red stele problems was chosen. Jewel strawberry will be planted in 2002. Two rates will be applied at two timings, fall and spring before planting, and compared to a Ridomil and untreated check. First treatment applied in fall 2001.

3) Evaluation Of Cover Crops And Reduced Tillage Systems For Weed Suppression In Strawberries. *John Zandstra, Ridgetown College, University of Guelph, Leslie Huffman, Pam Fisher, Anne Verhallen, OMAFRA*
A trial was established at the Cedar Spring Research Station to evaluate the influence of reduced tillage and a rye cover crop on weed growth in strawberries, as well as document the development and yield of strawberries planted in reduced tillage systems. Rye was seeded on 26 September, 2000 at a rate of 150 kg seed/ha. The rye was allowed to grow to a height of 30 cm and on 30 April 2001, glyphosate was applied at a rate of 2.5 l/ha to kill it. Tillage treatments were completed on 10 May and included the following 4 treatments:
1. **conventional tillage**: rye residue was incorporated with a rototiller to a depth of 10-12 cm.
2. **reduced tillage**: rye residue was partially incorporated with 2 passes with a conventional disk
3. **zone tillage**: a single pass with a trans-till (single shank followed by double fluted coulters, providing a worked area 15-20 cm wide)
4. **no- till**: no tillage operations

Superimposed on these main treatments were 3 weed control methods:
1. **herbicide**: a single application of Sinbar was applied 5 weeks after planting, according to OMAFRA recommendations
2. **weed free**: the plots were maintained completely weed free by hand hoeing
3. **weedy**: no additional weed control was provided

Plants established well in all treatments, Yield data will be collected in 2002.

4) Site-specific Intensive Sampling Project. *Heather Griffiths, IPM Modelling Specialist, and OMAFRA Berry Team*
To demonstrate use of information using GPS sampling techniques, and to study the relationship between soil characteristics, nutrient uptake and pest populations in strawberries, peppers and tomatoes. A 10-acre block of Annapolis was chosen for this project. In the planting year, 40 sites were flagged and GPS'd. Samples were taken at all 40 locations and distribution of the following components was mapped: Verticillium, nematodes, soil nutrients, soil moisture (weekly), leaf nutrient levels, weed distribution, PLH populations, early runner production, expression of verticillium in plants. Next year, we will monitor pests and harvest small plots at each of the 40 locations.

Preliminary analysis of data collected so far will be used to demonstrate and illustrate that: soil calcium levels are not related to calcium in the foliage; and that verticillium expression is strongly correlated to soil type, soil moisture levels, and soil populations of verticillium plus nematodes, but not verticillium alone.

Publications:

A poster " Common strawberry diseases" was developed and included with Pub #513, Growing Strawberries in Ontario" (Celetti, Fisher)

Fruit Production Recommendations, pub #360 : Revision now underway for 2002-2003 edition. New editions include improved notes on several berry pests. (Fisher)

Guide to Weed Control , Pub #75: Recommendations for berry corps updated annually (Huffman).

http://www.gov.on.ca/OMAFRA/english/crops/hort/berry.html Berries on the Crops page, OMAFRA web site: new content includes: herbicide injury in berry crops, diagnosing insects, diseases, and disorders in raspberry, and cover crop information.

Minor Use:

A 2-day tour of strawberry and vegetable farms was organized by OMAFRA staff for PMRA staff. (Chaput, Callow)
Minor-use submissions (J. Chaput)
Dual registered on newly planted strawberries (L. Huffman).

Newsletters and Crop Updates:

All Ontario Berry Grower: Published monthly in the GROWER and circulated to most Ontario strawberry growers through the OFVGA. Also available on–line with approx 250 electronic subscribers.

Berry Bulletin: A weekly update for consultants, scouts, growers, providing answers to frequently asked questions, and emphasizing best management and pest management practices. This message was faxed or emailed to subscribers and available on-line at no cost.

HortMatters: New in 2001, this newsletter is published biweekly OMAFRA staff. The target audience is agribusiness and consultants working in horticulture.

Meetings, Programs and Presentations:

Strawberry IPM workshop March 2001 : ½ day program in Guelph attended by 30 growers scouts and consultants. Support provided to AIMS scouts as requested throughout the season. (Appleby, Celetti, Fisher)

Strawberry Growers Farm tour twilight meeting Sept 7: This meeting was attended by over 50 growers from across the province. The theme for the educational component of this workshop was sub-surface drip irrigation. (Kessel, Fisher)

Irrigation Water Quality for Berry Growers: presented to North American strawberry Growers Association, Niagara Falls, Jan 12, 2001 and Eastern Ontario Berry Day, Kemptville, April 6, 2001 (Fisher)

Coordinated trials and Strawberry Varieties for Ontario :Brighton Berry Day (Fisher)

Day Neutral Strawberry Production: Ontario Hort Crops Conference Feb 2001 (Fisher)

Poster on the Coordinated Berry Trials was developed and presented at several meetings, including the Strawberry Research Conferences Niagara Falls, Jan 14-16 2001, and Horticultural Crops Conferences, Hamilton , 2001 (Fisher, Dale, Sullivan, Zandstra, Hughes, Madill)

OBGA and University of Guelph

Berry Crop Plant Propagation Program. *OBGA Achene Committee, Adam Dale and Becky Hughes, University of Guelph*

The OBGA continues to manage and fund the Plant Propagation Program. Adam Dale and Becky Hughes provide expert support to the Ontario plant propagation program and the Achene Committee. The SPUD Unit produces Nuclear strawberry plants for the program. Over 1,600 strawberry plantlets of 18 cultivars were produced for the screenhouse of the

Ontario Plant Propagation Program in 2001. The SPUD Lab currently maintains 25 strawberry cultivars for the Plant Propagation Program. Plantlets of all 25 cultivars have been requested for 2002. The OBGA is investigating consolidating the micropropagation and virus testing parts of the program at the SPUD Unit. Preliminary approval was received from CanAdapt and the Northern Ontario Heritage Fund for the start-up costs.

GINSENG

Since 1996 the ginseng industry in Ontario has moved forward in a difficult market. Agribusinesses, producers, the federal and provincial governments have cooperated in achieving a viable ginseng industry.

Producer commitment and support:

a) Establishment of the Ontario Ginseng Growers Association and approval to collect a check-off fee for all acres of ginseng produced in Ontario
b) Support of Diabetes research at the University of Toronto, which has led to the identification of ginseng as contributing to reduction of the symptoms of adult-onset diabetes. This year clinical trials will be conducted.
c) Participation in trade missions
d) Establishing a ginseng marketing co-operative to market directly, and through traditional buyers to Asia
e) Continued support of the AAFC Delhi research gardens
f) Grower access to the Advance Payments program
g) Lobbying PMRA, CFIA to resolve pesticide issues that affect the marketplace
h) Annual field day profiling chemical and equipment dealers
i) Annual grower meeting with presentations on current production research and practices.

Agribusiness support:

a) Participation in workshops to identify and control ginseng diseases
b) Production of a disease workshop manual (formerly Rhone-Poulenc, formerly Novartis) and a grower shop calendar to identify disease effective control programs (with OMAFRA)
c) Annual grower information sessions to outline current practices
d) Working with OMAFRA through staff training sessions and open discussion of production practices
e) Working with AIMS, OMAFRA (UAP) to establish a protocol for scouting ginseng

Government/University support:

a) Reduction of research garden space at AAFC Delhi
b) Competitive funding programs to address industry needs
c) Addition of Administration fees for research (25 % for U of G, 10% for AAFC)
d) Production of Publication 610, Ginseng Production Recommendations. This went from a 16 page booklet listing recommended pest control chemicals to an 88 page recommendation guide with 96 colour photos (OMAFRA, U of G, AAFC)
e) Facilitation of grower discussions with PMRA, CFIA regarding pesticide issues.

f) Development of a microscope club and Microscope Identification Guide for on-farm diagnosis
g) Development of the Ginseng and Herb Index page on the OMAFRA internet site.
h) Development of Ginseng and Herb page for AAFC
i) Pesticide screening and minor use trials (AAFC)
j) Weekly posting on the Internet of the ginseng agriphone. This went from a weekly recorded phone message to posting of current recommendations and diagnostic pictures on the internet.
k) Identification of production factors that affect root quality
l) Identification and detection of seed diseases
m) Identification of factors affecting spray coverage for disease control
n) Research accomplished over the last 5 years includes:
    - Deflowering to increase root weight
    - Screening products for control of Cylindrocarpon
    - Identification of Cylindrocarpon as the primary factor in the ginseng replant problem
    - Chemical properties of ginseng roots
    - The effect of composts on ginseng production and quality
    - N uptake and leaching in ginseng gardens
    - The effect of irrigation on ginseng
    - Trials for minor use registration
    - Chemical changes in rusty roots
    - Development of a rapid diagnostic procedure for Cylindrocarpon
    - Soil compaction studies as related to root shape
    - Use of ethryl for chemical deflowering
    - Organization of industry trade missions to China
    - Diagnostic support for diseases causing economic loss
    - Sprayer deposition trials
    - Control of Rhizoctonia in ginseng gardens
    - The structure of ginseng roots
    - Mycorhizal fungi associated with ginseng

GREENHOUSE AND PROTECTED CROPS

A. GREENHOUSE VEGETABLES

1. Increased use of the raised trough system for production and labour efficiency.
2. Increase in the number of acres with intercropping to minimize down time between crops.
3. Down time between crops minimized by the use of machinery to efficiently remove crop residue from greenhouses (20 acres cleared in 2 days)
4. Increased use of summer CO_2 to improve fruit quality and production. The use of flue

gas $CO_2$with hot water tanks has increased.

B. MUSHROOMS

A project to evaluate the emissions from mushroom compost produced on an aerated floor compared to a traditional rick is nearing the end of the field work. The sampling is in its final phase, comparing three different farms with aerated floors with three rick systems across Ontario. The samples are being analyzed chemically and are being rated by an odour panel.

Citation 75WP was submitted for label expansion for application to casing and discussions with the relevant parties are continuing.

A graduate student, investigating a unique spotting problem caused by *Pseudomonas tolassii*, successfully defended her thesis.

Another graduate student has successfully defended his thesis on the cause(s) for the aggressive nature of *Trichoderma harzianum* (biotype Th4) against *Agaricus bisporus* mycelium.

A graduate student working on the effectiveness of ozone to enhance post-harvest mushroom quality has finished the trials but has terminated his studies before completing his thesis. This work will be written up by a second party in the coming year.

A graduate student continues to investigate the fate of pesticides in recycled water used for mushroom compost preparation.

A graduate student has started to investigate the possible role of ammonia suppressants on commercial mushroom production.

The identification of disease samples continues to provide a significant asset to the industry as they battle the background levels of diseases, especially Trichoderma spp.

GREENHOUSE FLORICULTURE

Research and Services

1. Flowers Canada (Ontario) has funded projects at the University of Guelph and AAFC Vineland over the past few years. The first three-year projects terminated in late 2000/early 2001. Further funding for a number of these has been secured, extending the period of research for an additional three years. These include:

- *"Management of Soil-Borne Plant Pathogens of Ornamental Crops under recirculating Fertilizer Solutions"*. Javier Gracia-Garza, AAFC Vineland
- *"Development of an Integrated Pest Management Program for Thrips on Greenhouse*

Ornamentals". Les Shipp, AAFC, Harrow

- *"Biological and physical re-mediation in hydroponic ornamentals: cost effective technologies to promote crop productivity while avoiding environmental contamination"*. John Sutton, University of Guelph
- *"Management and measurement techniques for greenhouse nutrient recycling"*. Mike Dixon, University of Guelph
- *"Genetic and physiological analyses of low light tolerance in natural ecotypes and selected greenhouse ornamentals"*. Bernie Grodzinski, University of Guelph
- *"Floriculture / plant physiology"*. Theo Blom, University of Guelph, Vineland.
- There is also interest in funding a continuation of the fungus gnat/shorefly project, originally based in Vineland.

2. The funding of a Minor Use Technician in Vineland by Flowers Canada has resulted in considerable progress in the availability of new pesticides for the industry since the project commenced in 1997. Personnel changes have resulted in some gaps in the continuity of the position, notably for most of 2000. However, since January 2001, the position has been filled by Don Marshall, a technician with AAFC who was seconded to the project. The industry continues to benefit in a very direct and immediate way from this project.

Major Accomplishments

Research

1. *Management of Soil-Borne Insect Pests*. AAFC, Vineland, 1998-2001.

- Although this project has terminated, the potential for practical transfer of this technology to growers continues to look promising. The predatory rove beetle *Atheta coriaria* is now being actively researched by all the major biocontrol producers in Europe. At least one of these companies, hopes to have the beetle commercially available in the summer of 2002. Another is planning field trials in Ontario in early 2002.

2. *Management of Soil-Borne Plant Pathogens of Ornamental Crops under Recirculating Fertilizer Solutions*, AAFC, Vineland

- Soil borne plant pathogens can easily move in closed irrigation systems
- Fertilizer solution reservoirs can become contaminated with infective propagules of various soil-borne plant pathogens
- Certain biological control agents can reduce disease to level comparable to those of chemical fungicides
- Nutrient management in the growing medium may help reduce disease severity
- Combining biological products with complementary modes of action appears to be a viable disease control strategy

3. *Management and Measurement Techniques for Greenhouse Nutrient Recycling in Floriculture*, University of Guelph

- Alstroemeria and gerbera grown under long-term nutrient recycling without negative effects on crop production or quality
- Ozonation of recycled nutrient solution shown to have no negative effects under the

conditions examined

- Developed models to predict plant nutrient uptake in relation to net carbon exchange rate and various environmental parameters
- Conducted a survey on current status of nutrient recirculation in Ontario's greenhouse industry. Shown that currently 35% of the industry area is recycling their nutrient solutions.
- Shown that copper can be used to control green algae and reduce the incidence of Pythium in greenhouse crops. Determined the tolerance level of copper for several floral crops.

4.*Management of Micro-organisms and Allelochemicals in Nutrient Recycling Systems*, University of Guelph

- Quantitative data on UV dose required to inactivate spores of several pathogens have been published.
- Early detection of pathogenicity of Pythium (prior to visible symptoms) has been studied and confirmed in chrysanthemum. Early detection protocols, control strategies are being tested
- Chrysanthemums grown in recirculating nutrient solutions produce allelochemicals affecting subsequent plant growth

5.*Selection of Low Light Tolerant Cultivars for Full Year Production of Ornamental Crops*, University of Guelph

- Over 120 *Arabadopsis* ecotypes screened for specific genes conferring high productivity under low light
- Three productive natural lines have been identified. An F1 line with improved low light tolerance has been produced from these.
- Two commercial snapdragon lines with low light tolerance have been identified
- A new fixed-stage microscope and microinjector system for the analysis of pH and ion concentrations in the apoplastic fluids of intact plants had been developed

6.*Development of IPM Programs for Thrips*

- Work continues with Olympic Horticulture in the USA to register the fumed silica product developed at AAFC Vineland for thrips control.
- Work on modifying thrips behavior with pesticides has demonstrated significant effects with a number of products, in particular Avid. The effects include repellency, reduced egg-laying, and reduced feeding damage and virus transmission. Reductions usually exceeded 90%.

Extension

1.*The Use of Biocontrol in Canadian Greenhouses*, OMAFRA, Vineland

- A survey of greenhouse growers throughout Canada has been coordinated and conducted in conjunction with other provinces with major greenhouse producing regions. Results are currently being analyzed.

2.*Control of Lygus in Greenhouse Crops*, OMAFRA, Vineland

- A Lygus in Greenhouses Working Group was set up under the initiative of Gillian

Ferguson (OMAFRA, Harrow) to investigate control of this pest in greenhouses using biological control. The Working Group includes representation from Ontario and BC, and while most of the interest is from the vegetable industry, its importance to flower growers using biocontrol is also recognized. OMAFRA Vineland is involved in the screening of biocompatible pesticides for Lygus control.

3.*Cultivar evaluations/Open Houses*

- Poinsettia cultivar evaluation and Open House. Approximately 100 cultivars of poinsettia were evaluated and an Open House was held in December 2000. A report was prepared for poinsettia breeders who provided plant material for the trial. Another evaluation of similar size (plus Open House) is being run in 2001. These trials constitute some of the most extensive poinsettia evaluations in North America.
- Easter lily Open House in the spring of 2001 provided growers with the opportunity to view research results
- Evaluation of red rose cultivars. Ongoing trial

4.*Canadian Greenhouse Conference*

- Decision to move the conference from Guelph to Toronto proved very successful with a slight increase in attendance recorded over the previous year. Trade show facilities and parking were two highlights compared with the Guelph venue.

5.*Workshops*

- Three IPM workshops were held during 2001; two in Vineland in January and one in Ridgetown in March. The workshops have been held annually since 1992.
- Night School for greenhouse growers on "The Greenhouse Environment" run at Vineland for 10 weeks during the winter of 2001. A "Nutrition" night school is planned for 2002.

6.*Pesticide registrations*

- The Flowers Canada position working on minor use registration of pesticides for the industry, continues to result in new products becoming available to growers. In 2001, *Promalin* (for control of lower leaf yellowing in lilies) and Citation (for control of shoreflies) were registered. A number of other products have been submitted for registration.

NURSERY/LANDSCAPE & TURFGRASS

Research and service efforts continued in 2001, and the following accomplishments are highlighted.

Horticulture Industry Value-Added Business in Ontario

(K. Nentwig, M. Moore, Ridgetown College, U. of G.)

What began some years ago as a request for a graduate student to undertake the gathering of marketing and business statistics for Ontario's ornamental horticulture industry, has evolved into several years of continuous research, and finally reporting. Previous attempts at mail-out surveys failed dismally, however the one-on-one interview approach yielded excellent results.

Undertaken at Landscape Ontario's Congress 2001 in Toronto, and with a few additional contacts made separately afterwards, a total of 209 surveys were conducted. Of these, 182 had fully complete information, and the results show a general cross-section of business activity in the industry in 2000. Six questions were asked in the three-minute survey, handled by four staff of Ridgetown College including instructor Monica Moore, also working part time as a research assistant:

1. What is the business size (i.e. gross revenues) in 2000?
2. What is the increase/decrease from 1999, and what is expected for 2001?
3. What are the types of business activities undertaken?
4. How many personnel of various types are employed?
5. What are the payroll/personnel costs for 2000?
6. What is the regional location of the business? (first three digits of postal code)

Highlight of the results are outlined in brief below, and were published in Landscape Ontario's Landscape Trades: Industry News, in April 2001. A copy was also mailed to all the participating businesses voluntarily entered on a mailing list, shared with OMAFRA and U of G staff, and sent to industry representatives, with a full report to be compiled this fall. In addition, a second series of this same survey is being undertaken - one component of this was completed at the Garden Expo trade show in Toronto October 16 and 17, 2001, and the other will be at the 2002 Congress in January. For the second round of surveys, a Joint effort with the Farm Safety Association has been set up, to provide an over-view of awareness of and participation in their programs by landscape and related horticulture industry operations. Funding from the FSA, along with OMAFRA support under the Sustainable Rural Communities Program, and in-kind contributions from Landscape Ontario and the J.J. Neilson Arboretum (Ridgetown College, University of Guelph) have made these efforts viable. Future directions include possible development of a committee/organization to carry this work forward, supported mainly by industry, and the inclusion of statistics on a greater scope of business and volunteer work. Areas that could be added to the research[1] include a measure of the gross horticulture business of florists, golf courses, 'big box' outlets, conservation areas, municipal parks departments, and volunteers such as horticultural societies.

Farm-gate values (as published by OMAFRA) for the period 1996 to 2000 show a remarkable 77% growth averaging 19+% per year, which is reflective of the general sense of business activities in the value-added (after farm-gate) sections as well. The statistical information gathered through the surveys showed excellent increases from 1999 to 2000, and good potential for similar growth in 2001. Recent comments show that most of this has indeed actually taken place, however, the earliest feeling of projections for 2002 are

unsure, especially since September 11.
The small number of respondents compared to the estimated 12,000 business operations in Ontario has not been of major concern in this project. Some calculations were undertaken to show the potential size of the horticulture industry iii terms of gross revenues and personnel, However, these are to be taken as estimates only. The most important aspect of this project is that a system for the collection and reporting of these business statistics has been accomplished, and will form the basis of future work undertaken by industry and research personnel together.

A. Summary Highlights: BUSINESS ACTIVITY by ANNUAL GROSS REVENUES

1. 25% is in the range of $1 00,000 to $250,000;
2. nearly 75% is under $750,000, and nearly 90% is under $2,000,000
3. average reported industry increase from 1999 to 2000 was 16% (range from 18% to 25%);
4. average expected industry increase for 2001 was 14% (range from 13% to 20%).

B. Summary Highlights: BUSINESS SHARE by ACTIVITY TYPE

1. over 35% was in Landscape Construction, approximately 25% in Retail Garden Center;
2. Grounds Management and Lawn Care together make up over 18%.

Note: other activity types reported, making up the remainder of business share, include growers and greenhouses with retail outlets; flower shops in garden centers; design and consultation; snow removal.. pond/water feature and irrigation/lighting installation; and miscellaneous (lawn equipment sales, hardware, tree services, 'holidayscaping', container gardening, home and garden wares, arbors/gifts/accessories, cottage gift wares, wood construction, garden furniture, excavating/grading).

C. Summary Highlights: PERSONNEL

1. 95% of businesses have managers, 33% have supervisors, 65% have skilled/unskilled labour;
2. 18% of employees are managers, 90% of them full time year round;
3. 33% of employees are skilled workers, 67% of them full time seasonal;
4. 44% of employees are unskilled workers, 57% of them full time seasonal and 35% part time;
5. Landscape Construction employs 33% of the work force, Retail Garden Centers 26%;
6. Grounds Management and Lawn Care employ 17% of the work force.

Note: Payroll/personnel cost information was not well reported, partly due to lack of immediate knowledge on behalf of business operators, a reluctance to divulge personal information, and failure to include owner/operator wages and salaries

D. Summary Highlights: REGIONAL LOCATION

1.45% of respondents came from Central Ontario/Toronto;
2.34% came from Southwestern Ontario, skewed somewhat since additional surveys were made in the geographic 'area of involvement' of Ridgetown College;

3.14% came from Eastern Ontario, 5% from Northern Ontario.

E. Summary Highlights: BUSINESS SIZE PROJECTIONS

1. Using Statistics Canada 1996 Census figures for full-time landscape workers, a possible 8,600 business operations and $3.2 Billion in annual sales could be estimated;
2. Using industry estimates of 75,000 workers, a projected 12,000 business operations and up to $4.4 Billion in annual sales could be estimated;
3. Including the additional areas of horticultural activity in Ontario not surveyed[1], annual gross revenues and volunteer value has been estimated at $6.5 Billion for 2000.

[1] additional areas are planned to be added as funding sources are identified

Socio-Economic Capacity Building for Horticultural Beautification: A Model for Small Ontario Communities

(K. Nentwig, M. Moore, Ridgetown College, U. of G.)

From a pilot project in 1999 that formalized long-standing working relationships between the Ridgetown and District Horticultural Society and Ridgetown College, an agreement was reached to expand the project work in 2000. Previously a loose arrangement intended to include junior-school children in the growing and planting of petunia beds for the Town of Ridgetown, the new arrangements provided for maintenance and management of more extensive plantings. Petunia beds planted by the children at community entrances and in the central park area, along with some 30 wooden planter boxes, and other concrete planters and garden areas, were maintained by a JJ Neilson Arboretum Intern for the season. Funds for this in 1999 came mainly from the Rural Youth Jobs Strategies Program, and in 2000 from local businesses and service clubs.

With the success of the Ridgetown model, a request was made to Chatham-Kent Municipal Council for funding to expand and consolidate it within the community. Definite interest was shown, along with a request to see if other communities would also be interested. This led to a submission to Council in January of 2001, on behalf of four participating communities, for approximately $60,000 of area-rated tax-based funding, which was ultimately approved.

Community Beautification Committees with membership from Horticultural Society, Service club, and BIA/Chamber of Commerce members, along with interested business operators and local residents, were established to prepare letters of endorsement for the proposal. Two Interns were hired for the communities of Bothwell and Ridgetown, and for Tilbury and Wheatley, in late March. Both were equipped with vehicles, water tanks/pump systems, and tools. As employees of Ridgetown College working under the JJ Neilson Arboretum umbrella, these Interns were engaged in the horticultural beautification work, reporting to the local committees. Project work included design and planning for planting bed areas, plant list and supplier compilation, procuring of plants, planting, maintenance, and some pruning and planting of trees and shrubs. A total of fifty hanging baskets - Wave Petunias of either pink or purple colour - were planted and grown on in the Ridgetown College greenhouses. Overall, an estimated 10,000 annuals plus hundreds of perennials and many shrubs and ground cover plants, were installed and maintained.

Each project had its individual character. Wheatley concentrated on their twenty hanging baskets, plus some entrance signage and parkette beds. Tilbury's extensive raised planters in the downtown area, plus ten baskets and some bed areas in parks and subdivisions, was the largest project of the four. In Ridgetown, the program from 2000 was repeated, but with less work involvement from the volunteers and no solicitation of funding from local businesses. The Bothwell project included planting bed design, materials lists, and installation, since that community had very little horticultural infrastructure to begin with. Overall, the four projects went over very well, and plans are in place to repeat them in 2002, again with municipal funding.

The local committees are the focus of this report, as there has been a change in Municipal structure with the amalgamation of the 23 communities into one in Chatham-Kent. Previously, much of the horticultural work in these communities was undertaken as part of Public Works or Parks and Recreation mandates. Over time, more and more work was done by volunteer groups, in the interest of maintaining the horticultural standard. Within only a few years, the four communities mentioned above became 'volunteered out' and could not manage the work. With this program, each committee offers the involvement it can, and relies on the contracted worker(s) to carry the burden of the everyday project maintenance. Management by the committee ensures local volunteer involvement, and local funding through BIA/Chamber of Commerce and Service Club groups augments the Municipal component.

Results of this project, undertaken as a Community Beautification Internship of the JJ Neilson
Arboretum (Ridgetown College, University of Guelph) include:

1. development of local groups to take on community beautification projects;
2. development of a municipal tax-based funding system within an amalgamated regional context;
3. greater involvement of the community in previously mainly municipal projects;
4. an evolution of knowledge and capability within the groups to manage their own affairs;
5. involvement of trained students/graduates of horticulture in local community projects;
6. development of career employment opportunities for horticulture students;
7. integrated mobile watering systems.

Public awareness and support of these projects has been very positive. Steps in the process of developing the future model, suitable for small communities across Ontario, include documenting the process, publication of results, and contact with other communities who might require comparable services. As distances away from Ridgetown College increase, a Mentorship aspect will predominate, where local committees will be overseen in their project work. Closer to home, the Internship arrangement YAII remain in effect, as it requires more administration. The positive aspects of citizen involvement utilizing the volunteer energy of the community, coupled with the expertise and interest of trained horticulture graduates, and accompanied by municipal funding, will create a viable model for other small communities.

Nursery Research at Vineland: 2001 Update

Calvin Chong and Peter Purvis
Department of Plant Agriculture
University of Guelph
Horticultural Research Institute of Ontario
Vineland Station, Ontario

Brace yourself for the rising cost of water! The news this past year - in the wake of the Walkerton tainted water tragedy, which began in May of 2000 - has continued to be dominated by issues around water contamination, quality, and supplies across Canada, the U.S., and the world.

Water and Fertilizer Practices Under Scrutiny

Note the following:

- In Ontario, new provincial water standards requiring updated treatment equipment and facilities in most municipalities will see water bills at least doubling in the near future, if not already.
- The government allocated $10 million to municipalities for a study to ensure ground water is clean and safe. This is the "single, largest investment" of its kind in the province's history.
- Environmental issues focusing on waste disposal and water were major concerns discussed at the Floramentech 2001 Conference held in Toronto "strategic planning in research policy for the future of the ornamental and floriculture industries in Canada". In June 2001, the Ontario government had proposed a new law to set and enforce standards for nutrient management on farms and protect the environment (14). The proposed act is expected to become law in 2002. In February 2001, water and fertilizer management was the theme of the Growers' Group Short course.
- In the ripple of one of the driest summers in decades farmers, growers and landscapers are already worried about next year (17).

It is not surprising that "water and nutrient management" have become today's buzz-words in our industry circle. It will definitely "affect the way we do business in the near future".

Solution for Container Nurseries

Since the early 1990s, we at HRIO, presently University of Guelph Vineland Campus, together with Professors Glen Lumis and Paul Voroney from the Guelph

Campus, have been conducting a variety of research projects dealing with recycling of irrigation and compost wastewater and nutrients. These were summarized in last years research update (11) and other references (15, 16).

This past year we continued to forge ahead, continuing this decade-long research on the complete recycling of leachate wastewater and nutrients in container growing. In a presentation to the American Society for Horticultural Science (10), we estimated:

Up to 83% nitrate-nitrogen leaches from the containers. [This major amount of applied nitrogen, if not captured and re-used, would typically make its way into ourirrigation supply pond and surrounding ground water.]

Similar estimates for other major fertilizers are: ammonium-nitrogen, 33%; phosphorous, 86%; and potassium, 49%.

Up to 72% of applied water was recirculated.

Results from this past year, also confirmed what we have observed in prior years – container crops grew as well as or better with recycled than with non-recycled liquid nutrients, and consistently better than crops grown the traditional way with slow-release fertilizers.

Graduate student Joanna Gils (supervised by Glen Lumis and Calvin Chong) continued further tests which included harvesting and chemical analyses of leaf and root tissues of selected crops at monthly intervals in order to determine the nutrient demands of these crops during the growing season in a recycling system. As in past years, this research was supported jointly by the Landscape Ontario Horticultural Trade Foundation and IRAP (Industrial Research Assistance Program, National Research Council of Canada).

Garbage and Waste Composts Still Piling Up

Recall the "dead" Adam's mine project - and that Metro Toronto's huge garbage landfill at Keele Valley is scheduled to close in 2002. New plans will be introduced to double the amount of trash recycled starting with homes in Etobicokein 2002, then Scarborough in 2003, and city-wide in 2005. The city plans to direct 61% of its waste from landfalls by 2006. Earlier plans to divert 50% by 2000 fellshort. Only 30% was achieved. Experts say that composting of the garbage and re-use of the waste-derived composts in cropping systems is a key for sustainablemanagement and disposal of trash.

Many research projects at the Vineland Campus since the mid-1980s have dealtwith the reuse of raw and composted organic by-products in containerpottingmixes, rooting mixes, and as field soil amendments (1, 3).

Pot-in-Pot. This past year a scientific paper, co-authored with Glen Lumis, previously published in 2000 (6) received the Plant Products Award from The Canadian Society for Horticultural Science. The results were also summarized in other publications (7, 8, 9). The research demonstrated use of various mixtures of bark, peat, wood chips and paper mill sludge in pot-in-pot shade tree production.

As an extension to this investigation, we have been conducting a pot-in-pot trial with selected shade trees grown in mixtures of Metro Toronto municipal waste compost (0-75%) mixed with peat (75-0%) or bark (75-0%). Each mix also contained 25% raw paper mill sludge. Final growth measurements were taken in the fall and leaf samples are being analyzed. This experiment was conducted under the worst possible conditions, that is, a very heavy clay soil with poor drainage, persistent rain during the first year (2000) and drought during the second year (2001). It is noteworthy that, even under these difficult conditions, trees still reached marketable sizes close to or greater than 50 mm caliper.

Raw vs Composted Paper Mill Waste. We introduced the use of raw paper mill waste as a container amendment in the mid-80s (1, 5). Preliminary research in year 2000 indicated that (a) composted paper mill sludge in binary mixtures with bark was better than similar mixtures with raw or uncomposted sludge; and (b) municipal waste compost from Metro Toronto landfill also mixed with bark was even better.

A primary disadvantage of using raw paper mill sludge is the odour - which can be offensive at times. The composted product has no odour. This past year, we tested over 35 mixtures, including three sources of municipal waste compost (cities of Toronto, Guelph, and Waterloo) mixed with various amounts of raw or composted paper mill sludge plus bark or wood chips. This research was supported jointly by Environmental Systems, Azurix North America, and Healthy Futures.

Rooting mixes. Following years of previous research dealing with municipal composts (3, 4, 13) and paper mill sludge in rooting mixes (2), we compared rooting responses of cuttings in 20 different media formulated from raw or composted paper mill sludge (0-60% by volume) mixed with perlite or with Toronto municipal waste compost.

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Turfgrass Research

The turfgrass research program at the University of Guelph and the Guelph Turfgrass Institute covered a wide range of areas, including performance evaluations of slow release fertilizers for sports turf and golf course uses, evaluation of vesicular/arbuscular mycorrhizae on turfgrass seedings, evaluation of fertilizer/fungicide coated lawn seed mixes and coated bentgrass seed, comparison of techniques for assessing nitrogen status of turf, and two large cultivar evaluation trials (NTEP 2000 Kentucky bluegrass trial, GTI 2000 creeping bentgrass trial). Some of this work was supported by charging entry fees and on a contract-basis.

There is an ongoing program of evaluation of control methods for turfgrass diseases (Dr. T. Hsiang and Dr. G. Boland of U. of G.), including new biocontrol material for snow moulds. Turf diseases being researched in 2000 included necrotic ring spot, fairy ring, anthracnose basal rot, red thread, dollar spot, and snow moulds. Control methods for broadleaf and grass weeds were also evaluated (Dr. C. Hall, U. of G.), as well as ongoing evaluation of low risk alternative methods (corn gluten meal, K. Carey and E. Gunn).

Genetic improvement of turfgrass species using molecular biological and genetic transformation is an ongoing project in the lab of Dr. S. Bowley.

Environmental aspects of turfgrass management were studied through research programs examining remote sensing and on-site approaches to following soil moisture and solute dynamics in golf turf. (R. Heck, G. Parkin. R. Protz, C. Duke, P. Charbonneau, K. Carey - U. of G.). Other research in connection with the new putting green installation at the GTI is examining the measurement of soil moisture and irrigation scheduling for optimal water use and conservation. Ongoing research at the GTI in 2001 included examination of erosion and runoff from irrigated soil, as well as the effectiveness of turf filter strips in control of runoff (Dr. R. Rudra and Dr. B. Gharabaghi, Agr. Engineering, U. of Guelph). Dr. P. Groenevelt has initiated a study testing an experimental material developed by DuPont to use subsurface irrigation to deliver pure water to the grass, while using saline or polluted water as a source.

Julie Dionne started as faculty at the University of Guelph in July 2001, filling the vacant turfgrass management position. Filling this position has been a consistent recommendation of this subcommittee for several years, so this development is very gratifying. Dr. Dionne will be bringing an active research program to the University, including several graduate students, and will continue her work on aspects of turfgrass management, including physiology of abiotic stress tolerance, including freezing tolerance, as well as research into IPM on golf courses, alternative insect and disease control.

Technology transfer occurred back to the sponsor, as well as, the industry in general through reports and the GTI/OTRF Annual Turf Research Field Day, as well as research presentations at the Ontario Turfgrass Symposium. Research reports continue to be offered and expanded via the GTI World-Wide Web Internet site. The University of Guelph, OMAFRA, and the Guelph Turfgrass Institute were instrumental in organizing and presenting the 9th International Turfgrass Research Conference in Toronto in July 2001, which included mid-conference field trips to turf industry and research operations in Southern Ontario.

EXTENSION SERVICES FOR TURF AND WOODY PLANTS (OMAFRA)

OHCRSC - Nursery/Landscape OMAFRA Report
Jen Llewellyn, OMAFRA Nursery Crops Specialist

Accomplishments (Research and Services):
2001 OMAFRA IPM and Technology Transfer:

- *OMAFRA Nursery-Landscape Agriphone* (27 editions): A weekly bulletin (telephone recording, fax and e-mail) with timely recommendations for IPM of ornamental pests.
- *Horticulture Review Trade Magazine* (11 editions): Monthly Nursery-Landscape Bulletin covers issues such as IPM recommendations for ornamentals, emerging issues (NMP, PPV, Daylily Rust, SOD) and research (cover crops, biocontrol).
- *Landscape Trades Magazine* (2 editions): Feature articles included National Growers Group Priorities, Plastic Recycling in the Nursery.
- *GTI Advisor publication* (13 editions): Biweekly Woody Plants column covering IPM recommendations and emerging issues relevant to landscape maintenance.
- *OMAFRA Nursery-Landscape Index Page:* articles and photos related to the production and maintenance of ornamentals including information on pest management, media/soil and fertility, business etc.
- *OAMFRA Extension:* The Nursery Crops Specialist provides advice and technical information on issues related to the production and maintenance of ornamentals through technology transfer and upon request.
- Publication 383 S (Supplement to Nursery-Landscape Plant Production) - publish May, 2001
- Small-scale trial using entomopathogenic nematodes to control larval populations of Black vine weevil in container crops. When compared to combination treatment of *Heterorhabditis bacteriophora and Steinernema carpocapsae, Heterorhabditis megidis* nematodes gave 95% control of black vine weevil larvae in container-grown perennials *(Heuchera, Sedum).* Larval mortality was successful two weeks after application. *H. megidis* applications in field-grown *Taxus cuspidata* resulted in only 50% of larval mortality.

2001 OMAFRA Presentations, Workshops, Tours:

- L.O. Growers Short Course - "Innovations from the West Coast", "PPV and NMP update" (February, 2001)
- *Grower Workshops* (3): "IPM and Pest Review in the Nursery" (February, March 2001)
- L.O. Pesticide Symposium - *"It's a bug's life"* (March, 2000)
- Humber College - "Nursery IPM and Pest Review" (March, 2001)
- NuGro Sales Meeting, Hamilton "Pest I.D. and Biology" (July, 2001)
- Plant Products Nursery Growers Meeting - "Emerging pests update and biocontrol of black vine weevil" (September, 2001)
- L.O. Growers Summer Tour to New York and Niagara (August 30-3 1)
- *Radio* - CHWO Gardening Show (various interviews) *Television* - Indoor Gardener, Calling All Gardeners
- Toronto Civic Garden Centre - "Woody Plant Pests" (September, 2001)
- IPPS-Ontario Region "Daylily Rust and SOD update" (November, 2001)

2001 OMAFRA Learning Opportunities:

- Completed Nutrient Management Planning for Nursery and Greenhouse Crops (Course Hort 400) with the University of Maryland.
- Attended WNGG tour of Quebec Nurseries
- Participated in the National Growers Group Workshop for prioritizing national research priorities (e.g. pest management, national growing standards, minor use registrations).
- Organized a two-day tour of New York/Niagara nurseries and greenhouses for Ontario nursery growers

Articles and Publications

Articles included Turf Extension Summary for the GTI Annual Report for 2000, articles on dollarspot, professional development, the IXth International Turfgrass Research Conference and lawn watering in Greenmaster, Green is Beautiful, the Sports Turf Manager, and Turf News. Review articles and turf management updates were included in the Hort Reviews (*OMAFRA Bulletins*) and the GTI Advisor. The 2001 Supplement for Pub. 384, *Turf Management Recommendations* was produced, as well as draft Ontario IPM Manual for Turf (modified from *"Integrated Pest Management Manual for Landscape Pest in British Columbia"* produced by BCMAFF).

Research

Participated with MOE in a lawn care integrated pest management pre-pilot program. OMAFRA's part of this research program involved monitoring four lawns every two weeks for pest problems for 12 weeks.

Talks/Presentations/Workshops/Courses
Presentations were given to the Ontario Recreation Facilities Managers, the Ontario Turfgrass Symposium (OTS)2001, LO's Winter Workshops, the Turf Producers International (Albuquerque, New Mexico), Landscape Ontario Pesticide Symposium, London and Ottawa 2001, Nursery Sod Growers Annual Meeting, Growmark clients, the Turf Managers Short Course for 2001, the Ministry of the Environment Pesticide Officers, and the Hamilton Wentworth Stewardship Council.
Twenty-four turf agriphone messages were recorded during the 2001 summer season. These messages were also posted on the OMAFRA web site. There were subscribers to the Turf Agrifax service. OMAFRA Web Site Development included infosheets "*Taking a turf soil sample*" "*Sod Production*"

URMULE
Deltamethrin was submitted for minor use label expansion for turf, and some work with Nursery Sod Growers Association and Bayer was done on a minor use label expansion for Merit on sod farms.

POTATO

Research accomplishments

Monitoring changes in susceptibility of selected populations of Colorado Potato beetle (CPB) to Admire.(J. Tolman. AAFC, London) No significant changes in susceptibility to Admire were detected in several CPB populations collected in Ontario during the 2001 season. By contrast, the study showed that in other provinces, Colorado potato beetles are beginning to show signs of resistance to Admire.

Variety Trials. (Sam Squire, Alliston) The 2001 variety trials were conducted in three locations: Burford, Alliston and Shelburne. Cultivars from the New York, Michigan, Wisconsin and Quebec breeding programs were evaluated. The results of the trials were presented at the Potato Board meeting on December 5, 2001. For the white flesh table market, several worthy new lines were selected. Some of these varieties will be grown in commercial fields in 2002. Advanced lines from the Fredericton breeding program and from the North Central Regional Adaptation Trial were tested at the Cambridge Research Station (V. Currie)Eugenia Banks (OMAFRA) conducted strip trials in several sites across the province to evaluate the performance of new varieties in growers' fields

Minituber Production. **(B. Hughes, SPUD Unit, NLARS, U.of G.)**
Research trials have identified superior fertility treatments for greenhouse Nuclear minituber production of several cultivars. However these superior treatments are actually detrimental to the yields of other cultivars. Research is continuing in this area to provide

fertility regimes which increase the yields and improve the size distribution of the main cultivars in the seed program.
Research on the effects of growth regulators on plant growth, minituber production and production of Pre-Elite seed will continue using reduced rates.
The SPUD Unit is developing a technique to increase the ratio of minitubers to plantlets. This technique, once perfected should allow the SPUD unit and its contract growers to produce 10 times as much without significant capital investment

Evaluation of the Insecticide ACTARA to Control the Colorado Potato Beetle (E. Banks. OMAFRA) The effectiveness of the insecticide Actara was evaluated in 2 sites in the Shelburne area.Actara provided very good control of all CPB stages when applied as a foliar spray. Also, Actara provided good control of leafhoppers.

Evaluation of Admire used as a seed treatment to control Colorado Potato Beetle.(E. Banks, OMAFRA) Admire applied as a liquid seed or as a dust seed treatment provided excellent control of Colorado Potato beetle in two field trials The systemic activity of Admire in the field lasted for about 60 days after the treatment.

Evaluation of Fulfill to control aphids infesting potatoes. (E. Banks, OMAFRA)The new aphicide Fulfill was evaluated in a field trial. Although the aphid population was low when Fulfill was applied, the fact that the aphids were not able to colonize the crop suggests that this insecticide provides good control of aphids.

Control of Rhizoctonia Black Scurf with Quadris. (E. Banks, OMAFRA) Quadris applied in furrow provided very good control of Rhizoctonia Black Scurf.

Nitrogen Requirements of New Yellow Flesh Varieties (E. Banks, OMAFRA)
The new varieties Fabula, Caesar and Morning Gold performed very well at low/ and medium Nitrogen rates.

Skin Color Enhancement. (E. Banks, OMAFRA). Two applications of a plant growth regulator enhanced the red color of the red skinned variety Chieftan

Post Harvest Research (R.Yada, L. Copp, U.of G.). A correlation between starch granule size distribution and specific gravity was detected. As the ratio of large to small granules increased, specific gravity also increased.
Low temperature sweetening research suggests that metabolites such as ethanol and lactate may be useful indicators for the prediction of cold chipping quality, even though they may not be directly responsible for chip color development.

Management of Potato Scab Using Organic Amendments (G. Lazarovits. AAFC, London)
Some organic amendments have proven to be extremely useful to manage soil microbiology and fertility. This project will continue examining the mode of action of these products and improve their formulations so that the amounts to be applied in commercial fields is reduced while making them more universally effective in different soils.

II Service Accomplishments

- The Potato Session of the Horticultural Crops Conference was very well attended by growers. Four US speakers provided the latest information on potato production.

- The Potato School organized by A& L Laboratory and Omafra was held in Cambridge, Ont in March 2001. About 70 growers attended the sessions

- The Potato Agriphone, a toll free number, was available during the season to the potato industry. Messages were recorded each Monday morning from June until the end of August. Growers were alerted on pest problems and information on current potato issues was included. The messages were provided by the Omafra potato specialist..

- The Ontario Potato Board Newsletter was issued 4 times during the 2001 season. Growers received the newsletter by either e-mail, fax or regular mail.

- The Potato Board and OMAFRA worked closely to obtain the emergency registration of Quadris

- The Potato IPM Manual for potato scouts was updated in 2001. It provides useful information on how to identify potato pests and how to monitor fields.

- Forty five students attended the Training Sessions for potato scouts. Two sessions were conducted in the spring. Practical training took place in potato fields.

- A Potato Field Day was held on August 16 in Alliston. The field day included a display of new varieties at the Research plot of the Potato Board and display of potato equipment. Duane Preston, the potato specialist from Minnesota addressed several potato issues at the meeting.

- The New Liskeard SPUD unit, the tissue culture center of the Ontario Seed Potato Industry, continues to produce nuclear mini tubers to supply the seed requirements of 70% to 80% of Ontario seed growers. In 2001, the SPUD Unit maintained 35 cultivars *in vitro* and produced approximately 35,000 potato plantlets.
  A new project was initiated between MPB Cologne, the Ontario Seed Potato Growers Association and the Ontario Potato Board to develop a "Molecular Farming" industry In Ontario based on recombinant protein-forming potatoes. Healthy Futures funding has been received for this project. To allow the rapid multiplication of transgenic potatoes imported from Germany, the SPUD UNIT negotiated a bilateral protocol with CFIA which allows the SPUD Unit to receive and produce transgenic clones from Post Entry Quarantine while still under quarantine.

ROOT, BULB AND LEAFY VEGETABLES

Significant Research & Services Accomplishments

1. "Leafminers attacking field vegetables and greenhouse crops", J. Chaput, OMAFRA Fact sheet, Agdex 290/620, March 2000.
2. Survey of grower-perceived research priorities at Ontario Muck Crops Conference, Bradford, March 2000.
3. Identification of pea leafminer, *Liriomyza huidobrensis*, as the leafminer causing serious damage on celery in 1999.

SWEET CORN

1. Weed Management:

Herbicide research continued at Ridgetown College and University of Guelph (Simcoe). Presently, crop tolerance data is being collected on Callisto and additional varieties are being screened for tolerance to Accent. 2001 trials also looked at Basagran, foramsulfuron and Lontrel. Syngenta is presently pursuing a registration for Callisto in sweet corn for broadleaf and crabgrass control. Future work will include evaluating a Callisto-Dual-Atrazine tank mix for sweet corn.

2. Insect and Disease Management:

Fungicide and insecticide trials continue at Ridgetown College, and involve evaluating new products and product combinations for managing insect and disease problems in sweet corn.

A nematode trial evaluating marigolds planted back to sweet corn was conducted in 2001 (Celetti).

A graduate project is also underway in the Department of Environmental Biology, University of Guelph looking into alternative strategies (Bt corn) and new products (Spinosad, Gaucho seed treatment) to manage insect pests in sweet corn, and their impact on bees. This work is currently lab oriented but long term plans include moving into the field look at hive behavior close to sweet corn fields.

3. Cultivar Trials:

Fresh market sweet corn cultivar evaluations were located at Harrow, New Liskeard, Kemptville, and Ridgetown. Processing cultivar evaluations were located at Ridgetown and Huron. These trials are supported by growers, processing industry, and seed companies.

4. Management Studies:

Fresh market production on various biodegradable mulch films was evaluated at Ridgetown and Harrow, and included herbicide and no herbicide treatments (Harrow only.)

Several products look promising. With some products the cost is greater than standard clear mulch, but this should be offset by reduced removal costs.

Several management studies were conducted at Ridgetown College, and included:
-influence of in-row spacing accuracy on yield and recovery of processing corn
-influence of plant populations on HM8392, which has shown the ability to mature double cobs
-evaluation of narrow row spacing on yield and quality of processing sweet corn
-Management studies conducted at Ag-Canada Harrow included:
fresh market sweet corn soil nitrogen management on plastic vs. bare soil. This study has been ongoing for 3 years and a final report will be available soon.
development and calibration of a pre-sidedress nitrogen test for fresh market sweet corn

5. IPM Workshops

Sweet corn IPM training sessions were held for industry representatives

6. Nitrogen Use Verification Project

A large scale project to look at nitrogen use and losses over the course of the year in horticultural crops at 70 different locations was initiated. The project includes at least 9 sweet corn sites.

TENDER FRUIT

- Tender Fruit Grapevine technical newsletter published six times per year and delivered to 650 growers and 150 research, extension and industry personnel. Mailing costs were paid for by the OTFPMB. *Slingerland*
- Budwood mother blocks outside the quarantine zone were extensively sampled to provide a source of PPV-tested material for propagation. *Ferguson (CFIA)*
- Plum pox virus - international meeting was held with participants from Canada, US, Europe and Australia.*OMAFRA/OTFPMB/U. of Guelph*
- Sour cherries for processing were graded to USDA Standards for Tart Cherries for Manufacture. OMAFRA- Food Inspection Branch trained, accredited and audited cherry graders. *van Weerden*
- Approx. 65 samples of stone fruit or pears were analyzed for chemical residue and some additional samples tested for microbial contamination under the Food Safety Monitoring Program. There were four pesticide residue violations. *van Weerden*
- A new sweet cherry selection, V690630, has been propagated for testing through OFTA, and will be first available in 2002. *Lay*
- NC-140 sweet and sour cherry trial produced second crop in 2001. Gisela and Gi473-10 show the best rootstock performance to date. *Lay*
- A number of European and Japanese plum selections have been identified for further evaluation. *Lay*

- Sweet cherry performance trial at Cedar Springs is on-going, but yields in 2001 were generally medium to light with small fruit size. *Zandstra*
- Peach selection HW276 propagated for the OFTA evaluation program. *Miles, Cline, Guarnaccia*
- A new NC-140 peach rootstock trial was initiated in spring 2001, with the planting to be completed in 2002. *Miles, Cline*
- Canadian Clonal Gene Bank has 304 *Prunus* accessions and 132 *Pyrus* accessions. All *Prunus* accessions tested were negative for plum pox. Requests for germplasm that were filled were 9 requests (93 accessions) for *Prunus* germplasm and 11 requests (43 accessions) for *Pyrus* germplasm. *Luffman*
- AAFC pear breeding program transferred to U. of Guelph at Vineland Station. *Hunter*
- Input into the development of transgenic 'Bartlett' and 'Bosc' pears has been reduced because of licensing and freedom-to-operate considerations. *Hunter*
- Two apricots ('AC Harojoy', 'AC Harostar') and three pears ('AC Harrow Crisp', 'AC Harrow Gold', 'AC Harrow Delicious') have been protected in Europe. *Hunter*
- Characterization is continuing of fungal proteins eliciting a systemic acquired resistance (SAR) response to fire blight. The protein gene inserted into tobacco appears active. *Brown, Svircev, Tian*
- AAFC has developed a multi-centre biotechnology team for long-term research on developing PPV resistance in peach. *Brandle, Brown, Miki, Sanfacon, Shoshing, Svircev, Tian*
- Elite (tebuconazole) and Medallion (fludioxonil) are effective in controlling rhizopus rot of peaches. *Northover.*
- Indar and Sovran were as effective as Bravo giving 94-98% control of plum black knot. *Northover.*
- Post-harvest treatment with 1-MCP slowed fruit softening in plums and apricots but was ineffective for peaches. *Skog*
- Pear orchard plots mulched with woodchips had lower soil temperatures and higher moisture content than non-mulched plots. *Derkacz*
- Foliar nutrient supplements and soil-applied calcium nitrate improved fruit colour and firmness (at harvest and storage) in peaches and nectarines. *Derkacz*

TOMATOES

SubCommittee Activities. The Ontario Tomato Research and Services SubCommittee met on Nov. 20, 2001 to discuss state of the industry, research and service activities, research and service issues, to prepare recommendations to the OHCRSC and the OPMRSC, to prepare a list of minor use priorities, and to review the subcommittee membership list. The research and service activities reported are presented below. After the Nov. 20th meeting, considerable feedback was received by the subcommittee chair about the placement of the 'Breeding and Cultivar Development' research issue as the 5th priority. Therefore, a new vote was called by the subcommittee chair, and was carried out by email, fax and telephone from November 28th to Dec. 4th. The majority of responses received back were in favour of placing 'Breeding and Cultivar Development' as the number one priority. The decision was not unanimous and the chair felt that placing 'Breeding and Cultivar Development' as the 1st priority for the processing sector and leaving it as the 5th priority for the fresh market sector best represented the views of the subcommittee members.

Breeding and cultivar development. Thirty six entries in the processing tomato yield trial were evaluated at 4 locations in Essex and Kent counties. Data on yield, canning recovery and processing quality were obtained. Approximately 600 breeding selections were made from the Univ. of Guelph, Ridgetown program. Breeding material from AAFC, Harrow was evaluated for agronomic performance and resistance to early blight, septoria leaf spot, anthracnose, powdery mildew, bacterial canker, blossom end rot and viruses. Seeds of two anthracnose resistant lines will be released to private breeders. Interspecific breeding material was evaluated for agronomic performance and fruit quality and selections were made for further evaluation. Simple sequence repeat markers are being developed and characterized to detect relationships among tomato cultivars and to screen for disease resistance and other traits. Six primers were identified which may be useful in screening genetic material for resistance to bacterial canker and 16 for powdery mildew. Processing company breeders are using breeding lines from AAFC, Harrow and Univ. of Guelph, Ridgetown in company breeding programs with good results.

Evaluation of 8 fresh market tomato lines from private breeding programs was carried out. EX 0334 and Ex 0336 (Asgrow Seeds) showed promise as early maturing cultivars.

Nitrogen fertilization management. Studies continue to look at nitrogen fertilizer requirements for processing tomato cultivars. Although total and marketable yield were influenced by N rate, quality parameters such as fruit colour, size, firmness and soluble solids did not appear to be affected by N rate. Blossom end rot increased as N rate increased.

Plant spacing management. Marketable yield of 2 early maturing, small vine size cultivars was increased by 1.2 to 1.9 tons per acre over a three year period by increasing the plant population from 13,870 to 16,735 plants per acre. More equidistant row arrangements provided an advantage in both total and marketable yields in 1 of 3 years. A reduction in foliage and fruit disease also occurred with the more equidistant row arrangements. Fruit maturity, as measured by the amount of green fruit harvested, was not consistently affected by the row arrangement or plant spacing. Fruit size and soluble solids were also not affected by row arrangement or plant spacing.

Crop protection. Work is continuing to develop a PCR-based assay to detect bacterial diseases. Screening procedures to detect viable bacteria in large seed lots are being developed. Kocide was registered through the minor use program for control of bacterial diseases on tomato transplants in greenhouses. Actigard continues to show promise as a systemic acquired resistance product for the control of bacterial diseases. Several outstanding new products are being tested that provide broad spectrum fungal disease control. Calypso showed equivalent Colorado potato beetle control to Admire. Cultivar tolerance trials were carried out for several herbicides to determine injury symptoms from various rates of application. There was no significant visual injury or reduction in yield on 13 processing tomato cultivars with Pinnacle. Pinnacle + Prism, Pinnacle + Sencor/Lexone and Prism + Sencor/Lexone did not cause visual injury or yield reductions of processing tomato. Studies on weed management programs were also carried out. Dr. Darren Robinson was appointed to fill the weed scientist position at the University of Guelph, Ridgetown College.

Paclobutrazol. The use of this growth regulator has been shown to advance crop maturity by up to 6 days. This is significant as it allows processors to start earlier and harvest through a longer period.

GLP compliancy. Certification for AAFC, Harrow (herbicide program) is expected in the new year.

Irrigation. The benefit of irrigation was again shown with the dry weather of 2001. The Ontario Weather Network will be able to calculate and report evapotranspiration rates in 2002.

Extension activities. Training was provided to AIMS pest monitoring scouts. A Tomato Information Day for growers was held on March 6 and a Crop Tour was held on July 20, 2001.
New vegetable transplant production recommendations including disease management have been put into OMAFRA Publication 363.

Food safety related activities. The Canadian Horticultural Council (CHC) has developed a food safety binder for the fresh fruit and vegetable industry that draws awareness to the issues that could affect food safety. AIMS funding through the Healthy Futures program will expand upon the CHC guidelines in that it will attempt to develop specific practices for each crop sector in areas where hazards are identified. OMAFRA had a food safety team that provided growers at the Ontario Horticultural Crops Conference with information about identifying hazard areas from the field to the buyer, and what practices can be implemented that would be effective in securing the safety of food produced by growers in Ontario. Growers have reviewed procedures that they employ on farms and have used best management practices which have served as a foundation for the safe food we currently enjoy. An OMAFRA Food Safety Program Lead is in place to work with growers on this concern.

STATE OF THE INDUSTRY

AGROFORESTRY

University of Guelph

***Submitted by:** Naresh Thevathasan, Research Scientist, University of Guelph*

The University of Guelph is the only University in Canada with an active research program in temperate agroforestry systems. It is also the only university to have implemented large-scale controlled and replicated intercropping trials (trees and other crops) and riparian buffer strip experiments (1985). In 1987, a tree-based intercropping research program was initiated using about 10 different species of hardwoods and coniferous trees, annually intercropped with corn, soybeans, wheat and barley. Row spacings of a 2 and 15 metre are also incorporated into the design which covers 30 ha. From this research, more than 20 scientific papers have been published in the areas of microclimatic modification, soil moisture and fertility interactions, soil nitrogen and soil organic matter dynamics, earthworm ecology and allelochemical interactions. Additionally, five M.SC. degrees and two Ph.D. degrees have been conferred on site researchers. Some of the objectives for research activities planned over the next few years can be met in two to three years since the experimental infrastructure is already in place.

Agroforestry research at the University of Guelph is administered through the Department of Environmental Biology. A strategic plan for agroforestry research and service needs over the next 4 to 5 years has been prepared and is included in the agroforestry Sub-Committee Report. More emphasis is being placed on addressing societal concerns related to climate change mitigation as well as nutrient management and water quality improvement through the adoption of agroforestry-based land-use practices in Ontario. Emphasis increased in these areas because many groups in the agriculture and forestry in Ontario are actively working towards finding solutions and alternatives to address these concerns and contribute to a healthy environment.

The many other traditional benefits of trees in agroforestry systems such as food, fiber, fuel and shelter will remain an important consideration in the design and implementation of agroforestry research at the University. It is important to recognize that agroforestry has been included in the Program for Energy Research and Development (PERD) as one of the potential land-use systems in Canada for bio-energy production. Riparian buffer zones and windbreaks-shelterbelts have been identified as the most suitable land-use systems under the National PERD program.

The strategic approach to agroforestry research included in this Agroforestry Sub-Committee Report conforms with results-based management(RBM) using a Logical Framework Analysis(LFA) component. This technique will ensure the execution of all research goals and objectives while at the same time remaining adaptive to changing research objectives, as well as emerging agroforestry policy issues.

Ontario Soil and Crop Improvement Association (OSCIA)

Submitted by: *Andrew Graham, Program Advisor, OSCIA*

Ontario Environmental Farm Plan (EFP)

The EFP program continues, for now, as in previous years. It is anticipated that local workshops will be offered to farm families through to the spring of 2002. The $1500 EFP Incentive Program continues to be offered on a first-come, first-served basis. A growing number of rural water quality programs jointly funded by either the provincial "Healthy Futures for Ontario Agriculture" Program or the federal" Agricultural Environmental Stewardship Initiative" as well as local municipalities are requiring an EFP deemed to be appropriate as an eligibility requirement. The EFP is also a requirement of the recently launched quality assurance programs developed for corn-fed beef and veal organizations. These groups have wisely recognized the educational value of EFP, and have placed their support behind it by making it a requirement. Other groups are expected to follow this lead.

The Ontario Farm Environmental Coalition has repeatedly stated that every environmental program offered to the farm community, whether it be federally or provincially funded, should require all participants to first have an EFP deemed appropriate.

Since April of 1993,there have been about 20,250 participants in the program. Of these, 12,400 have submitted their action plans for peer review and have been" deemed appropriate". The incentive has been claimed by 9,200 participants. This represents about $11.9 million in federal contribution to on-farm best management projects, matched by over $37 million invested by farmers on the same projects.

OSCIA and our delivery partner OMAFRA, continue to work with several other provinces who wish to launch similar EFP programs using the Ontario workbook and delivery system as a model. Many other countries are also asking questions and closely monitoring progress in Ontario.

Current funding for EFP is provided by Agriculture and Agri-Food Canada 's CanAdapt Program which is administered through the Agricultural Adaptation Council. The current contract expires soon and OSCIA strongly supports a continuation of the program, although some changes may be warranted.

Restoration of American Chestnut - Farm Response to a Species at Risk

This has been identified as an ongoing project in the 1999 Sub-Committee Report. This two-year demonstration project ended in March of 2000. Project goals were achieved through an educational and awareness campaign and a network of 24 planting demonstration sites, coordinated by OSCIA with assistance from many partnering agencies and organizations. The final report for the project, including a compilation of site data, photographs, maps, news releases and other pertinent information, is contained on compact disc from OSCIA.

Wildlife Impact Assessment for Ontario Agriculture

This work was conducted by OSCIA on behalf of the Ontario Agricultural Commodity Council, to investigate the economic impacts of wildlife on agriculture on a sector and species-wide basis. Wildlife impacts were quantified through a one-year scientific approach. The study focused on wildlife caused losses that occur directly to standing crops and livestock through a comprehensive survey of five commodity sectors: field crops (corn, wheat, soybeans, forages), fruits, vegetables, beef and sheep. While the full range of wildlife species was addressed, the major emphasis was placed on deer, geese, raccoons, coyotes, wolves, dogs, blackbirds and other species of birds. The study also investigated prevention measures, compensation mechanisms, access to advise and recommendations for next-steps. The issue of wildlife caused losses is not one to be faced by the farm population alone, but requires the attention of conservation groups and society as a whole wishing to protect species and enhance habitat. The final report is available on request from OSCIA.

Evaluation of Buffer Strips along Watercourses on Ontario Farms

This was identified as an on-going project in the 1999 Agroforestry Sub-Committee report. The investigation and analysis has been completed. Forty farm buffer projects were visited and the landowners were interviewed. The final report was submitted in February 2000 and is available on request from OSCIA.

Grand River Conservation Authority

Submitted by: *Martin Neumann, Forest Resource Planner*

Ontario's 38 Conservation Authorities continue their role as primary delivery mechanism for tree planting programs and related in-field agroforestry extension. Program theme areas focus on windbreaks, riparian buffers, fragile land retirement, carbon sequestration and landscape health and biodiversity. Other themes are addressed in some watersheds. The promotion of these "Best Management Practices" supports a collective drive toward healthier watersheds, healthier communities, and sustainable agriculture. A recent Environics Poll of Ontario farmers revealed that conservation Authority staff are their most trusted source of resource management information.

It must be noted that Conservation authorities are not generally in a position to undertake agricultural research. Trends and gaps are simply identified to the Agroforestry Sub-Committee of OHCRSC.

One problem which has been mentioned in previous reports is the availability of nursery stock, and availability of "source-identified" nursery stock. Important work has been done in this area since 1999. The forest gene Conservation Association has developed and is piloting a seed certification process. Some seed collectors have already been certified by them. Certified seed and source-identified stock are essential. This is a major step toward being able to make informed decisions regarding matching seed source to planting destination, an important genetic consideration in agroforestry.

The Ministry of Natural Resources (MNR) commissioned a "Historical Tree Planting Report" and "A Review of Current and Potential Seedling Production in Ontario". These Reports provide helpful information related to the stock supply situation. MNR also was a lead in the partnership that resulted in the Environics polls to probe landowner opinions and motivations related to tree planting and forests.

Two major trends are noteworthy in agroforestry as they relate to Conservation Authorities: the resurgence of cost-sharing opportunities for farmers contemplating "Best Management Practices", and the announcement of the first major tree planting initiative explicitly undertaken for the purpose of carbon sequestration. The former is funded mainly by municipalities and OMAFRA's Healthy Futures Fund, while the latter is funded by Ontario Power Generation. In both cases, program delivery is primarily by Conservation Authorities. These two developments dramatically change the scene for agroforestry in southern Ontario.

Ontario Maple Syrup Producers' Association (OMSPA)

Submitted by: *Dave Chapeskie, R.P.F., Agroforestry Specialist, OMAFRA*

There are about 1,200,000 taps placed on 2,000 farms annually in Ontario. The commercial industry in Ontario generates an estimated $15 million dollars from the sale of Maple products annually. The maple industry is seen as a growth industry with about two-thirds of the syrup consumed in Ontario being imported. Modest growth of the industry has occurred over the past decade no doubt tempered by high establishment costs facing prospective producers.

The 2001 crop of maple syrup was normal in near proximity to the Great Lakes in southern and south-western Ontario, below normal in central Ontario and near normal in eastern Ontario. Cooler than normal conditions away from the Lakes had an adverse affect on sap flows, especially in central Ontario.

The effects of the 1998, 1999 and 2001 drought on yields in Ontario are unknown. Preliminary research results from the applied research designed to determine the effects of the 1998 ice storm on productivity in eastern Ontario are now available. This research shows some negative affect on productivity where damage is severe but the effects of the storm on overall production are not known.

The Ontario Maple Syrup Producers' Association (OMSPA) has been active in developing and promoting a voluntary quality assurance or Seal of Quality Program (SOQ) for its members. About 100 maple producers have signed up for this program which is analogous to the Vintners Quality Assurance Program (VQA). A second edition of the SOQ Manual was released in 2001.

OMSPA has an active research and technology transfer committee which works closely with OMAFRA Specialists to identify and guide worthwhile project initiatives.

Society of Ontario Nut Growers (SONG)

Submitted by: *Doug Campbell, Representative, Commercial Nut Growers*

The 2001 crop year for nut trees in Ontario was not very favourable; there was favourable heat but rainfall was very deficient. Crops were smaller than usual and the size of nuts was down, unless nut crops were irrigated. Total crop production was about the same as last year, mostly because additional acreage is coming into production each year. Further acreage will be coming on stream for production in the years 2002 to 2005.

The numerous hot and humid days experienced in 2001 provided ideal conditions for major disease infections. Diseases such as walnut blight and pecan scab were sufficiently prevalent that they reduced crop yields significantly.

The value of irrigation was proven in 2001. Irrigated groves produced up to double the yields of groves which only had natural rainfall. Shallow or gravelly, sandy soils had difficulty supporting good nut crop yields.

Because the supply of nuts in 2001 was not abundant, the prices for quality product were high in all nut species. For example, the large fancy grade of sweet chestnuts brought as much as $3.00 per pound for growers. However, there was demand for all sizes including the small category. Yields of 1000 pounds or more per acre brought incomes of $3000 or more per acre for growers.

Ministry of Natural Resources (MNR)

Submitted by: *Eric Boysen, Private Land Policy Advisor, MNR*

Managed Forest Tax Incentive Program (MFTIP)

http://www.mnr.gov.on.ca/mNR/forests/mftip/htm:

The MFTIP evolved from the Managed Forest Tax Rebate Program in 1998. Woodlands must be a minimum of 10 acres (4 hectares) to qualify, and must have a Management Plan approved by a Management Plan Approver. Eligible properties are first re-classed from residential into a Managed Forest Tax class and property taxes are then reduced in a two-step process: land value is first reassessed equivalent to farmland and then taxed at 25% of the residential tax rate.

In 1999, 9,300 properties totaling 1.5 million acres (607,300 hectares) were participating. Twenty-nine percent planned to conduct a commercial harvest, 51% planned to harvest trees for personal use and 48% ranked environmental protection as a primary objective.

After five years, MNR is currently conducting an internal program review.

Ontario Stewardship (originally called Private Land Resource Stewardship Program) - *http://www.ontario stewardship.org:*

This program was initiated in 1995 in response to MNR's exit from the operational private land forestry program. There are now 40 Stewardship Councils across southern and central Ontario.

To facilitate operation of the Councils MNR provides a staff member (Stewardship Coordinator) and $10,000 per year in seed money to each Council. Seed money is invested in community level projects, and is often leveraged with other money. Volunteer hours are tracked and reported to show total amount invested in private land stewardship.

Many stewardship councils have representatives from the agricultural community, but each council is generally reflective of the landscape it serves.

In 1999/2000, 3,955 volunteers contributed 58,602 volunteer hours. Investment in the Ontario Stewardship Program from partners was $7.3 million in cash contributions and $6.4 million from in-kind contributions.

Stewardship Councils successfully apply to Trillium Foundation, Healthy Futures Program, Human Resources Development Canada, Ontario Works, Canada Trust and other programs.

Tree Cutting By-laws:

Municipalities can pass tree cutting by-laws either under the Forestry Act at the county level or under the Municipal Act for a lower tier municipality with a population of less than 10,000 people.

Currently 21 counties have by-laws under the Forestry Act, and 13 municipalities with tree conservation by-laws under the Municipal Act. There has been a recent interest in stronger enforcement, especially where there is urban sprawl. For example, York Region successfully charged a logger under their by-law resulting in a $96,000 fine and three months in jail.

Many by-laws are being modernized to be more reflective of proper forestry practice.

Clearing for agriculture is often exempt from the by-laws, prompting many developers to claim forest clearing for agriculture, then going for development approval after.

Science, Training and Technology:

The Ministry of Natural Resources still provides many extension level courses and workshops geared towards farmers and rural landowners. A tree markers certificate course is offered annually at the Frost Centre. Certified Tree Markers must be utilized on Crown lands but are optional on private lands. A southern Ontario version of the tree marking course is offered near Turkey Point to deal with more southern issues.

MNR has released a publication entitled " A Silvicultural Guide to managing Southern Ontario Forests". The tree marking courses are designed to implement the recommendations contained in this manual which defines both proper and improper forestry practices. Improper practices include allowing woodlots to be grazed by cattle and other livestock.

The 24th Annual Forest Health review was held in Orillia. Plum Pox, Pine Shoot Beetle, West Nile Virus and Long Horne beetles were discussed.

MNR continues to sponsor or participate in woodlot shows such as the Outdoor Farm Show, the International Plowing Match, the Hastings Plowing Match, and a number of annual woodlot conferences in southern Ontario. Individual Stewardship Councils offer local awareness and education opportunities for local landowners.

The Forest Gene Conservation Association organized and delivered four seed collection and handling workshops, training about 100 participants in techniques designed to ensure seed source control and genetic integrity.

Survey of Ranchers, Farmers and rural Landowners- *http://www.whc.org/publication/24-10-00-e-htm:*

A group of national and Ontario agencies sponsored a benchmark survey of rural landowners in spring 2000. The survey was conducted by Environics Research in Toronto, and was officially released by the Federal Agricultural Minister Lyle Vanclief at the Royal Winter Fair. The survey asked questions related to attitudes, needs and activities surrounding private land stewardship. In Ontario, 1,215 people, 795 farmers) owning 25 acres (10 hectares) or more were contacted. Complete details are contained in the report.

Climate Change Research Activities:

MNR is conducting several background investigations into the role that afforestation could play in the sequestering of carbon (i.e. carbon sinks).

The Rural Landowner survey contained questions specifically related to programs and incentives required by landowners of marginal agricultural lands. Some reports estimate close to one million acres (400,000 hectares) could and/or should be planted to trees across Ontario. MNR is investigating "how much, where, and other operational aspects of these questions". Silv-econ consultants are preparing a background report on historical tree planting programs and MNR is investigating nursery capacity and willingness to produce suitable planting stock in adequate numbers. MNR is working with partners such as Ontario Power Generation, Conservation Authorities and stewardship councils to determine best bets.

Forest Fragmentation and Parcelization:

There is increasing concern about the continual erosion of the productive and potentially productive land base due to urban sprawl. The United States has developed "Smart Growth" programs, which restrict urban sprawl through strategic investments in infrastructure, and disincentives against new development. Other States have "Rural Legacy" programs, which keep rural areas intact for agriculture and forestry.

Notes are available from a conference, which was held on fragmentation in 2000.

Ministry of Agriculture, Food and Rural Affairs

Submitted by: *Dave Chapeskie, R.P.F., Agroforestry Specialist and*
Todd Leuty, Agroforestry Specialist

Maple Syrup Industry:

Regional weather patterns continue to be the predominant factor affecting yields of sugar bushes across Ontario. After mediocre crops in eastern and central Ontario in 1998 and 1999, yields improved in 2000. This was particularly encouraging in the area, which was impacted by the 1998 ice storm. In contrast, yields were down in southwestern Ontario after several years exhibiting normal yields. The impacts of drought, ice storms and other natural disturbances appear to be masked by regional weather factors.

Overall provincial yield in 2001 was down by 58% over 2000, with a production of 985,000 litres worth $10,800,000 in syrup sales. It is expected that most Ontario produced syrup will be sold at the farm gate, retail and farmers market outlets without difficulty. It should be noted that at the present time there is a surplus of syrup in Quebec, which could invariably increase the amount of syrup imported into Ontario, particularly the eastern areas. The main affect of this surplus is expected to be a depressed price for bulk syrup.

It is evident that a significant number of existing maple producers are considering expansion of their enterprises and a noticeable number of others are considering entering the industry for the first time. Expansion of the industry will be tempered somewhat by the level of capital investment required to establish or expand a maple enterprise.

A new publication entitled "Economics of Maple Syrup Production " was co-published by the Canadian Farm Business Management Council and the Ontario Ministry of Agriculture, Food and Rural Affairs. This publication is proving to be very popular in Ontario and elsewhere. It will be an important aid for maple producers considering expansion, new beginners and others.

OMAFRA continues to work with OMSPA and MNR to strengthen Ontario's contribution to maple research efforts. In 2000, Ontario hosted an International Conference featuring research activities related to ice storm recovery.

Christmas Tree Industry:

Ontario's Christmas tree industry is believed to be in a steady state at the present time. An estimated 600,000 trees are harvested annually. A variety of species are grown including scotch pine, white spruce, balsam fir, fraser fir and others. In recent years, consumers have shown a preference for fir over the other species.

Most Christmas tree growers in Eastern Ontario have largely recovered from the effects of the 1998 ice storm. Drought has been a problem in some areas and a few growers are evaluating the costs and benefits of trickle irrigation.

There continues to be a need for more weed control options particularly herbicides to control triazine resistant weeds.

Nut Tree Industry:

The commercial nut tree industry has its greatest potential in southwestern Ontario where the regional climate is moderated. At present, an estimated 2,500 acres (1,012 hectares) have been established. Most of the plantations are less than 10 years of age. A variety of species are being planted including black walnut (highest yielding cultivars) english walnut, Japanese heartnut, northern pecan, hazelnut and sweet chestnut. In eastern and central Ontario, the potential for the nut tree industry is more limited and has not been fully assessed. There are a number of demonstration sites in Eastern Ontario.

Testing of mechanized cracking equipment began this season following the purchase of equipment from Texas. SONG is most interested in commercial-scale cracking of heartnut walnuts and other mechanization of orchard management.

Grower awareness regarding the need for good site selection and intensive management is paramount. There is a great need to test and register pesticide options for weed and insect control in nut tree plantations.

SONG and the evolution of an Ontario nut orchard industry may prosper faster if they associate themselves with an orchard commodity research subcommittee, such as the tender fruit or pome fruit research subcommittees, in addition to the agroforestry subcommittee.

Farm Woodlots:

OMAFRA continues to provide technical support for regional woodlot conferences and to a lesser extent more local seminars and workshops.

OMAFRA has also worked closely with MNR in helping guide research designed to study the effects of the ice storm on woodlands. The ministry continues to promote the value of farm woodlots as an integral part of the whole farm enterprise as well as the value of windbreaks and shelterbelts on farms.

APICULTURE & POLLINATION

Current State of the Industry (Doug McRory, Provincial Apiarist)

The winter of 2000-2001 was not a good one for bees in Ontario. Overall losses were in the range of 25%. This was much higher than the normal 10% that most beekeepers experience. Some beekeepers that pay close attention to all the details of good queens, lots of feed and excellent packing did winter well. For the industry as a whole it meant a spring of recovery for colony count.

The summer produced a short intense flow of very white honey. Strong hives brought in an exceptional crop of clover honey. Many areas then dried out to the point that the colonies did not produce until very late in September when some colonies where they received rain made some honey from Goldenrod and Fall Aster. The provincial average will be over 100 pounds per hive, which is very close to the long-term average for Ontario. The price of bulk honey is averaging about $1.07 per pound which is up considerably from last years price. Beekeepers are moving honey to market this fall!

Beekeepers are concerned about the possibility of Varroa becoming resistant to Apistan. The Bee Inspection program of OMAFRA has been testing in the Cornwall area and to date the tests indicate that resistance is starting to develop. Reports from British Columbia and New Brunswick indicate that they have Varroa that is resistant to Apistan. As Provincial Apiarist, I have been in contact with Dr. Don Wilson of Bayer who own the next available product – Choumphos - for varroa control. Dr. Wilson has gone as far as possible until either Apistan Resistant Varroa or Small Hive Beetles is detected in Canada. He will now be able to move forward on this issue. Varroa that are resistant to Apistan is a reportable condition under the Federal Animal Protection Act that Dr. Brian Jamison administers in CFIA. We would like to have Choumphos registered now so we could use it in the areas of greatest risk of resistance near the original boarder areas where Varroa first invaded Ontario. We would also use it to alternate with Apistan in areas where Apistan still works to extend the life of the Apistan. Beekeepers would also like to see Oxalic Acid available as it is a "softer chemical" to control Varroa. Work is being carried out on Oxalic Acid, which is showing good promise, but a better method of application is still required. Allison Skinner will report on the co-operative project with Dr. Medhat Nasr on Oxalic Acid. These additions would fit into our IPM program for Mite control.

Beekeepers are also concerned about the possibility of oxy-tetracycline resistant American Foulbrood (r-AFB). r-AFB has been found in many states of the USA including New York and Alberta and BC in Canada. The Bee Inspection program of OMAFRA has been sending samples of any AFB that is found during AFB inspections. To date no r-AFB has been detected in Ontario. As Provincial Apiarist, I have been working with Dr. Don Nelson, Adony Melathopoulos of Beaverlodge Research Station, Grant Hicks of Alberta Beekeepers Association and Dave MacMillian and Heather Clay of Canadian Honey Council on getting registration of Tylosin (owned by Elanco in Guelph) and Lincomycin (owned by Pharmacia and Upjohn in Orangeville) for AFB control in Canada. We are still awaiting the US data that may be enough to get it registered in Canada. Even though we do not have r-AFB in Ontario we would like these products registered to be able to alternate with oxy-tetracycline and extend the life of it in an Integrated Pest Management Program (IPM).

Beekeepers are also concerned about the possibility of large-scale spray programs for West Nile Virus control. As Provincial Apiarist, I have been in contact with Dr. Gord Surgeoner who sits on the Provincial committee involved with West Nile Virus. He assures me that we will be involved if any program is developed for aerial application of pesticides.

Beekeepers are also concerned about the ongoing problem of Aerial Application of Furadan to Sweet Corn. There were some losses this season again but most beekeepers reported that the colonies involved did recover and the losses were not as severe as two years ago. There were two modifications to the protocol to allow sprayers to use Furadan to spray without notification to the beekeepers if they put it on before the tassel was out of the whirl and the time was moved up to 6:00 PM for September and 5:00 PM for October spraying. The OBA Tech Transfer Project did some experiments on covering the entrances of colonies left near fields treated with Furadan, which will be reported on at this meeting.

Beekeepers are also concerned about the possibility of introduction of Small Hive Beetles into Ontario. The Bee Inspection Program over the last two seasons has trained most of the bee inspectors to recognize this pest. To date no SHB has been reported in Ontario. We do need more time assigned by bee inspectors to look for this pest especially along the boarder areas.

Beekeepers and bee inspectors are concerned over what appears to be an increase of American Foulbrood (AFB). Bee inspectors reported that with the few hours that they had available for random inspection they would always find AFB without going very far. Beekeepers themselves are reporting concerns that there is more AFB around than before. 16% of beekeepers reported having to deal with AFB last season. If more inspection budget were available it would be well spent on looking at more colonies for AFB.

Beekeepers are concerned about whither Imidacloprid is causing damage to their bees in Ontario. There seems to be a correlation to high winter losses to beekeepers that have had bees in areas where potatoes or orchards were treated with this product. Everyone is awaiting independent, hard data on the sub lethal effects of this product on the bees. The French beekeepers feel there is a definite problem. It remains to be seen if it can be scientifically shown to be a problem or not in Canada.

Even with all the potential problems new beekeepers are coming into the business. We expect
the number of beekeepers will be down some when the data is finalized. Some hobby beekeepers are dropping out as they are finding the mite management too demanding. The total colony count may be down also this year due to the major loss last winter. Even so, the industry is quite healthy!

APPLES

2000 Crop

For the second consecutive year returns for the previous year's apple crop (in this case 2000) were disastrously low. China has replaced Washington State in the Fuji markets of

Southeast Asia. With a large crop of traditional varieties, Washington now also pushed their Fuji into eastern markets of North America. Although this is not a popular apple in the Northeast the overall supply swamped the orderly marketing of our traditional varieties. The results were predictable.

Throughout the fall of 2000, winter and spring of 2001, returns to producers were below cost of production. Orchards were being pushed out well into the spring of 2001, a job usually done in the fall after harvest. There were several reports of orchards abandoned due to lack of financing for 2001 production costs or outright bankruptcy.

Grower dissatisfaction with commodity prices focused on the Ontario Apple Marketing Commission even though it had no control over markets or pricing. A producer vote to dissolve the Commission was conducted by the Ontario Farm Products Marketing Commission. The vote did not carry but indicated a high level of dissatisfaction. A consulting firm was hired to delve into industry concerns and make recommendations. The industry was prepared to accept major changes to their 33-year-old organization.

2001 Crop

In mid harvest, with export promotions on hold, the annual launch of the domestic fall promotion on hold, market research and primary production research programs on hold, with industry/government shared cost projects for marketing, promotion and market research on hold and with proposed revisions to the Restart Assistance Program for producers on the hold, the OFPMC surprised all by declining to restructure the Commission and simply dissolving it. With new locks on doors to the Apple Commission offices and access to files denied, the industry was advised to "take a fresh look".

The industry is now in a state of disarray. Limited funds supplied by the OF&VGA are being used to retain the Commission's general manager as the industry struggles to regroup and come up with a structure that will suit industry needs. At this time there is no mechanism in place to provide industry contributions for research or to access government funding. Grower representation on various committees is now on a voluntary basis.

From a marketing standpoint the industry is under less pressure than last season. Although there are no Apple Commission numbers to substantiate this the general feeling is that we have a manageable crop size that is down 25% from last year. Along with a smaller crop on the West Coast fruit should move to markets in an orderly fashion. We have no tools in place for advertising, promotion or the collection and dissemination of market intelligence to the various players involved. It is feared we will lose ground in the competition for shelf space. There are in the Toronto area, sales representatives from British Columbia, Washington State, New Zealand, Chile and South Africa, all working to gain shelf space. We have little or no presence to counter this.

BERRY CROPS

The berry crop industry remains strong especially for established growers (Table 1). PYO is declining in some areas but remains constant in areas with increasing ethnic populations. Dayneutral strawberries and fall bearing raspberries are extending the Ontario berry season into the fall in some areas. Most berries are sold at the farm gate, pick-your-own or through wholesale markets. The processing industry remains small. Farm gate revenues of approximately $ 22.0 M were reported for blueberries, raspberries and strawberries in 2000 (OMAFRA).

Table 1. Acres harvested and farm value of blueberries, raspberries and strawberries in Ontario over the last four years.[1]

Crop	Acres Harvested				Farm Value ($'000)			
	1997	1998	1999	2000	1997	1998	1999	2000
Blueberries, High Bush	---	370	410	415	1455	2055	2050	1925
Blueberries, Low Bush	---	65	30	40	375	105	75	50
Total Blueberries	550	435	440	455	1830	2160	2125	1975
Raspberries	1100	1110	975	850	3740	3505	3230	2685
Strawberries	4000	3955	3600	3625	17350	17430	17360	17300
Total	5,650	5,500	5,015	4,930	22,920	23,095	22,715	21,960

[1] Source - OMAFRA website.

Weather conditions continued to challenge the industry in 2001. The after-effects of the wet weather in 2000 were seen in 2001, with low vigor and yields in strawberries and winter injury in raspberries. A late frost on May 12th was very damaging to many early strawberry varieties throughout southern Ontario. Dry conditions in 2001 made irrigation necessary throughout the season in most areas.

Fresh market demand for **strawberries** is increasing and prices were good in 2001. Strawberry yields were disappointing in much of Ontario in 2001. Irrigation was necessary throughout the season. Many renovated plants grew back slowly due to the lack of water and high temperatures. This may affect yields in 2002 ,as adequate soil moisture is need for flower bud formation in August and September. Anthracnose fruit rot was a problem in 2001 especially in dayneutral varieties. Cyclamen mite is becoming a very severe problem. Spider mites are becoming a widespread problem and the damage was unusually widespread in 2001.

Many **raspberry** growers reported symptoms of winter injury in the spring of 2001. Cane disease in 2000 may have made plants more susceptible to winter injury. Yields were good to light. Crops that were irrigated produced higher yields. Yields of fall bearing raspberries were lower than normal likely due to the dry and very hot summer weather. The two-spotted spider mite population was high in raspberries in 2001.

The **blueberry** crop was average in 2001. Bird control remains a problem. Anthracnose fruit rot and white grubs are the next most expensive pests in blueberries.

The Ontario **cranberry** acreage remains stable although prices have fallen due to overproduction in other parts of North America. One producer is moving towards organic production as consumers become more interested in functional foods.

Nutrient management and the provincial fertility recommendations for berry crops remain important issues given the proposed Nutrient Management Act. Evaluation of the nutrient recommendations for berry crops in Ontario has been a research priority of this committee for many years. Research on the effects of foliar nutrient applications and fertigation of strawberries was initiated by the Department of Plant Agriculture in 2001.

Food safety and water quality continue to be issues both for growers and consumers. As they are often eaten fresh and due to past incidents of contaminated imported berries, berry crops are particularly prone to the consumers' perception of food safety.

Weed control continues to be problematic across the province consuming lots of hand labor and limiting the useful lifespan of berry crop fields. The lack of **reliable help** continues to be major factor in limiting the size of berry plantings in Ontario.

Continued harmonization of **pesticide registration** between Canada and the US is needed to make new pesticides equally available in both countries.

Rapid diagnostic services are very important to the industry. The turn around time at the Pest Diagnostic Clinic has improved, but interpretation of the results is necessary.

The **Ontario Berry Growers Association** (OBGA) continued its support of berry crop research in Ontario in 2000. As well, the OBGA continues to manage the Ontario Berry Crop Plant Propagation Program and to pursue plant breeders rights agreements on new berry crop cultivars. The OBGA has approximately 250 grower members from all across Ontario representing about 80% of the strawberry and raspberry production in Ontario.

CRUCIFER CROPS

Acreage Trends:

In general the acreage of broccoli, cabbage and rutabaga is expected to remain stable. The acreage of fresh-market cauliflower is expected to decline whereas the acreage of processing cauliflower may increase. The acreage of fresh-bunched radishes is expected to decline. These changes reflect changing consumer trends and fewer growers staying in the business.

Production Trends:
In general insect pests and weather related problems continue to be the most limiting production issues. Lack of access to new reduced risk crop protection materials is cited as a major production issue.

Pest Management Programs:
Many growers of cole crops monitor their own fields or have a consultant checking the crop regularly. The AIMS group and Cargill Ltd. also provided scouting services in 2001 for some cole crop sites. The costs of delivery and the fractured nature of the crucifer crops industry are major limiting factors to further IPM adoption. IPM programs for rutabagas are no longer delivered by any agency or persons.

Marketplace Trends:
In general the marketplace is very poor and very frustrating for crucifer crop growers. The amalgamation of the chain stores and increasing demands on growers have kept prices poor and profit margins in the negative.

Outlook for 2005:
A generally bleak outlook is predicted for this commodity group all around, unless growers receive a better price for their product, more and more will leave the business.

Production Statistics: The estimated acreage of crucifer vegetables is shown in Table 1.

Table 1: 2000 Production of Cruciferous Vegetables in Ontario[1]

	Acreage	Farm Value ($'000)
Broccoli	1,800	3,840
Brussels sprouts	200	760
Cabbage, Asian	1,050	3,175
Cabbage, Other	2,700	5,200
Cauliflower	2,600	8,600
Radish	540	1,200
Rutabagas & turnips	1,950	8,500
Other Asian-type crucifers	2,000	N/A
TOTAL	12,840	approx. 32,000

[1] OMAFRA

GINSENG

The 2001 season was relatively dry. Many issues concerning diseases were able to be explained by coverage and timing of control applications. Rusty Root is increasing in some gardens. Overall, the crops size was down in 2001 all across North America.

Number of Growers: 265

Acres in production: 4,800

Crop size:

Overview of changes in production and pricing from 1996 - 2001

	2001	2000	1999	1998	1997
# producers	265	250	250	250	250
acres	4,800	4,500	4,500	4,500	4,500
Lbs produced	3,500,000	4,500,000	4,000,000	3,000,000	2,500,000
$$/lb. Dried (Can)	12 - 25	12 - 25	10-27	14 - 20	12 - 28

Comparative production:

- Ontario: 3.5 million in 2001; down from 4.5 million in 2000
- B.C.: 1.6 million in 2001 down from 2 million in 2000
- Wisconsin: 600,000 in 2001 down from 900,000 in 2000
- North America: 5.8 million in 2001 down from 7.5 million in 2000

Crop prices 2001: $15.00 - $23.00 Can / lb for 3-yr root
$18.00 - $25.00 Can / lb for 4-yr root
up to $30.00 for good, larger root
$12.00 / lb for dirty root
$15.00 - $16.00 / lb for roots with slight surface rust

There is some concern over the practice of consignment selling of root. Some growers are selling root with very little downpayment. This root is shipped to Hong Kong with the expectation of further payment but no guarantees.

Crop Quality:

Overall yield is down in 2001. Quality varies widely. Root quality is directly related to the choice of growing site. Most problems occur on poorly drained soils. The problem is exacerbated by the fact that low market prices have left little room for growers to adequately address disease control. In order to cut costs, some growers are taking short cuts and these have led to loss in quality.

The two diseases that remain of concern to the industry and that limit yield and quality are Rusty Root and Cylindrocarpon. Cylindrocarpon has been linked to the ginseng replant problem. Adequate control of this fungus will stabilize root quality and allow growers to remain on good sites.

GRAPE & WINE

2001 crop year was a memorable year. Early consensus from the grower community was that many varieties had not come through the winter very well. Hardest hit were varieties such as Vidal that had very poor bud break and many Cabernet Sauvignon and Cabernet Franc seemed to have suffered from winter injury.

The preliminary crop estimate was that crop size would be about the same as last year. Most Concord fields were down 25-30%, yet west of Beamsville the crop was very good.

The extended drought raised a lot of concern and was particularly hard on vines on heavier soil without the benefit of irrigation. Our estimate was that the crop would be down from potential of about 60,000 tonnes by 20%. Over the past few seasons many growers have invested in irrigation equipment. For those growers the drought had less negative impact, with most of these growers reporting good yields and excellent quality.

Overall the crop was bigger than expected and was made up as follows:

		For Comparison
	2001	**2000**
Concord/Niagara	10,116	10,674
Other Labrusca	625	643
White Hybrid	12,807	14,761
Red Hybrid	4,771	4,071
White Vinifera	12,260	11,583
Red Vinifera	9,712	8,867
Ice Wine	2,324	included above
TOTAL	**52,605**	**50,599**

There were some problems with SV23-512 that were to be shipped to Canandaigua Winery. The acid levels fell to unacceptable levels during the first weekend of September. Over 100 tonnes were not sold because of this.

In addition, there were surpluses in other varieties as well, including Baco Noir, Foch, DeChaunac, Vidal, Chardonnay, Cabernet Franc and Zwiegelt. At this time we still do not know the exact amount of surplus

Overall the quality of grapes was excellent and there was very little disease pressure.

The challenges for the future will be to try and sell all of the grapes we grow. Our estimated potential crop for 2002 is over 60,000 tonnes, with 50,000 being wine grapes.

Grape Production for the Fresh Market

Source: Andrian Huisman, Secretary Manager
Ontario Fresh Grape Growers Marketing Board

The fresh grape volume at 1,664 tons was the smallest crop on record. This being said, the volume of the Sovereign Coronation variety increased 50% this year. This variety now represents 44% of the total fresh market sales. The Fredonia crop was off almost 40%. Fresh market grape returns were as follows: Fredonias - $962/ton ($901-2000) and Sovereign Coronation $1,500/ton ($1,595-2000). Net returns for Sovereigns have dropped steadily from $1,888 per ton in 1997, as volumes increased. The Sovereign crop is expected to continue increasing as new plantings come on stream. The industry continue to explore ways to promote the sale of SC in new markets outside of the traditional Quebec market thus lessening the impact the additional volume might have on the sale of the traditional blue grape varieties.

Grape Season Overview

by Ken Slingerland, Tender Fruit and Grape Specialist, OMAFRA

Weather

Our northern climate, around the Great Lakes, is unpredictable and summers like 2001 with an extended period of the hot, dry weather was not typical for the tender fruit and grape areas of Ontario. In recent years there has always been a month or two of heavy rains to replenish the orchards and vineyards during the growing season. In 1992, we had 164.6 mm of rain in July, in 1996 we had 151.6 mm in April, and in 2000 we had 199.0 mm in the month of June. Our greater problems have normally been draining the fields of water during critical times in our growing season.

Rainfall was sparse but fortunately, we had a moist month of May (Table 1.) to give the vines a good start on growth through the extreme dry season to come. Grapes, without irrigation on harder soils, struggled not only for berry size and overall tonnage, but for vine survival as well.

Table 1. Precipitation in mm - Vineland Station

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Total
2001	39.4	52.2	79.6	41.0	95.6	43.4	9.0	46.6	51.2	116.2	574.2
85 norm.	61.8	57.6	64.8	70.3	70.6	75.7	67.4	71.6	73.9	63.5	703.2

On May 22, 21.6 mm of rain fell at Vineland Station. The next significant rainfall of 25.4 mm fell 89 days later on Aug. 19. There were no other rain dates over 10 mm during this time and only 8 days with rain over 5 mm.

During a key phase of fruit growth and development from June 12 to Aug. 18, a period of 68 days, there were no significant rain days (over 6.2 mm). Some areas along Lake Ontario and on top of the Niagara Escarpment were fortunate enough to experience isolated thunderstorms that dumped 25 to 50 mm of rain in a very short period. But this was the exception and fortunately many growers had access to water for irrigation during this critical time. Rainfall this fall has been well above average and should help to relive some of the stress from the vines as they head into winter.

Monthly average temperatures for the growing season were generally warmer than the 85-year norm by 1 to 2° C. Only the month of July, surprisingly, was slightly cooler by 0.6° C.

Heat units were up substantially for both Base 5 and 10° C (13 and 16% respectively) during the early season for the months of April, May and June. This resulted in tremendous early growth and development for grapes. In some cases though, too much growth. July had approximately 8% fewer heat units but the heat units in Aug. were approximately 15% higher than the 85 year normal.

It is difficult to tell how meaningful heat units really were this year as plants struggled with excessive heat some days combined with the severe dry conditions. A high number of heat units is not always an indicator of a successful grape season! Getting warm temperatures and ample moisture in the spring is probably the key to a good growing season.

Plantings exceeded pullouts but white French Hybrids (Seyval Blanc, Vidal and V-23512) continue to decline. Growers continue to plant cultivars (Shiraz and Merlot) that are in demand by the industry, but riskier in sites that may prove to be a challenge in a cold winter.

Land prices continue to be driven up by the expansion of the grape industry, as interest is still high amongst new growers wanting to start new wineries. Established growers are now slowing down on new plantings as they try to recoup their investment from plantings from the last five years.

Agri-tourism continues to flourish especially during the season with the near perfect weather. The wineries continue to be a bustling place to be for tourists during most of the weekends throughout the year. Expansion of existing wineries and applications for new wineries continue to strengthen the grape and wine industry not only in Niagara but the rest of Ontario.

Expansion in the southwest continues with new plantings and another winery pending. Strong interest has continued in Prince Edward County as growers consider more new plantings.

Bill George Jr. of Vineland was selected the 2001 Grape King.

Summary

Most of the major crops came through the season with outstanding quality and good yields. The success of the Niagara-on-the-Lake Irrigation System and the close proximity to water for other growers was a key factor in relieving vine stress and maintaining the quality and quantity of grapes. There is some concern for the overall health of vines, especially those plants that were not irrigated. October rains have replenished the soils and hopefully most plants are in good shape to get through another winter.

The year 2001 can be summed up as another difficult growing year but most growers were able to rise to the challenge and produce high quality grapes.

GREENHOUSE VEGETABLES

Crop Conditions (S. Khosla and G. Ferguson)

General Comments:

Light level in Nov & Dec 2000 (week 45 – 52) was below average. This was followed by slightly higher light level in Jan 2001 (week 1 - 3). The subsequent light level was average with some extreme peaks (May – week 16 – 18) followed below average light level in Sep – Nov (week 35 – 42). The average temperature in 2001 ranged from -15°C to several weeks of temperatures ranging higher than 30°C. The 2001 summer rainfall was below average. The warm dry conditions influenced fruit quality with some growers losing 5 – 10 % in production.

The 2001 season was full of surprises: The price of natural gas was 2- 3 times higher than the previous season, alternative fuels were used by some growers to mitigate their costs, there were problems in plant raising and establishing, new insect and disease problems, air pollution problem with damage to some crops, trade issue with the US (approximately 22% duty on tomato export to the US), increased pressure to be more environmentally friendly (Nutrient Management Plan, plastic recycling, organic waste management).

There is also an increase in the number of growers installing raised trough systems to assist in nutrient recycling, slab water management, decrease labour costs during planting, crop management, and crop clean out. This system also lends itself well to interplanting which has been tried for both the fall and winter planting.

Tomato

Production: Early tomato planting experienced problems with fruit setting due to low light conditions. Harvest was delayed by 2 weeks and fruit setting was a problem. Latter plantings did not experience the same problems. Overall tomato production was normal with some growers reporting an increase while others reported significant losses due to disease problems and fruit quality penalties. Fruit quality problems such as BER, sunsclad and improper colouring were prevalent. Trust, rhapsody and quest were the most commonly grown beefsteak cultivars. The most popular truss tomato was the Clarance with some Tradiro and Dynamo grown.

Pest Management: Significant pest problems included the following:
PepMV - First incidence of PepMV in Canada occurred in the fall of 2000 in Essex County. This disease carried over into 2001 and about 34 operations or about 65% of the

total tomato acreage in Essex County were affected. Reported losses varied from 0-20%. Symptoms were associated with stress conditions particularly low light levels and fungicide applications.
Potato psyllids – First report of this aphid-like pest in Ontario occurred early summer. It was reported to have affected only 3 operations and losses were minimal.
Tomato bug or *Engytatus modestus* – First report of this pest in Canada occurred in Essex County in late summer. Damage by this pest directly affected yield due to feeding pattern. Shoots, flowers and entire inflorescences can be cut off. By early fall, it was estimated that about 36 operations were affected. Speculation about entry of this pest into Ontario via Georgia field transplants is not likely, given that inspection some of these fields yielded no evidence of the presence of populations during the summer period, and that growers of processing tomatoes apply a pesticide known to be effective against this bug, soon after transplanting.
Diseases – There were incidences of bacterial canker, botrytis and corky root rot. Incidence of pith necrosis also increased. Of significance was wilting, particularly in Rapsodie, the cause of which could not be ascertained by various labs.

The occurrence of the number of new pests with 1 year in Ontario demands answers to the method of import of these pests.

Cucumber

Production: Early plantings experienced establishment problems due low light conditions and excess watering. This delayed harvest by 2 weeks. Subsequent production was good. There is a continued interest in growing 3 cucumber crops per year to maintain yield, quality and pest and disease management. Powdery mildew tolerant cultivars continue to be popular with the CMV tolerant cultivar gaining in popularity especially for the late summer fall planting. The most common cultivars are Bodega, Pyralis, Gardon, Tiffany, Corinda, Dominica. The number of growers growing mini cucumbers has increased slightly with an increase in demand for this product.

Pest Management: Major problems for this crop were as follows:
Significant crop losses due to CMV in fall crops. Eleven operations at least were infected and one operation reported 27% plant loss. Weather related increased incidence of aphids were the cause of this. Symptoms varied among different operations. Fortunately, one CMV-tolerant variety, Gardon staved off serious symptoms due to this virus.
Pythium caused significant plant loss in some fall crops at the transplant stage depending on timing of planting. Hot weather at the time of transplanting favoured incidence of this root disease. Up to 30% plant loss in 1 operation was attributed to this disease.
There were at least 3 incidence of Fusarium root and crown rot this year. It's likely that more growers may have been affected because symptoms of this disease may be confused with those of gummy stem blight or Pythium root rot. This disease has persisted in at least 1 operation for 3 years and caused significant economic losses this year.
Powdery mildew remains the prime concern of all cucumber growers. There is demand for new effective, non-phytotoxic products or strategies.

Positive reports of the cucumber industry is a slight increase in the acreage adopting biological control which is now about 27% and perhaps a trend towards accepting biological control. For 2002, 2 new operations will try BC, and in 2003, another large operation is preparing to do same. About 43% in total are using IPM techniques ie primarily carrying out scouting to determine pesticide applications. Obstacles to more rapid adoption biological controls include Beet pseudo yellows virus, cost of biological control, lygus bugs, cucumber beetles.

Pepper

Production: The light levels appeared to coincide well most of the pepper plantings in that at the time of maximum plant stress due to flower and fruit development light levels increased. Fruit quality was greatly affected especially in situations where the greenhouses were not shaded with whitewash and the plants were too generative. The most common red cultivar was the Triple 4, with some trails of Mandi. The yellow cultivar was Bassonova and the orange cultivar was Sympathy.

Pest Management: Major pest problems for pepper crops were as follows:
European corn borer – losses were significant in some operations estimated at $6,000 per acre at one operation.
Lygus bug – no adequate controls exist for this pest.
Although not a problem, the silver leaf whitefly was identified in one pepper crop and this could signal a threat to cucumber and tomato crops.

Powdery mildew was generally well controlled and no major losses due to Fusarium were reported.

Mushrooms

Ontario continues to lead the nation in mushroom production with 49.3% of the total production. According to Statistics Canada, 79 million pounds were sold in 2000, an increase of 6,933,500 pounds more than 1999. Farm gate value was $118 million, an increase of $21.7 million (7.3% increase). Fresh market price was $1.62/lb., an increase of 3 cents. Processing grade mushroom prices decreases by 3 cents to $0.86/lb. Industry representatives speculate that the increase in production may be attributed to a combined set of factors: introduction of more Phase 3 compost, an increase in demand of fresh mushrooms from the US market due to several closing and bankruptcies, favourable exchange rate, and some facility expansion.

Total labor cost was 54 cents per pound of mushroom harvested, down 3 cents from last year. Owners returned to the Ontario economy $42.9 million in salaries and wages, employing 2006 full and part-time employees.

Growers see a modest increase in the industry again in 2001 with slightly higher fresh and processing prices.

There is an anticipated increase in Oyster mushroom prices for the new year. However, it was extremely difficult to predict with any certainty other specialty mushroom production or price estimations.

Trichoderma harzianum, biotype Th4, (green mould disease) persists at a background level with occasionally outbreaks, some with significant economic impact. Those farms with an increased hygiene awareness and appropriate control plans are indicating their disease management practices will reduce or at least maintain the devastating effects of this disease however are anticipating an increase in Green Mould in the province for others. Problems with a number of other diseases and mites including dry bubble disease (*Verticillium fungicola*), wet bubble (*Mycogone perniciosa*), viruses, Cobweb (*Dactylium dendroides*), bacterial Blotch and mites are considered well managed with no anticipated outbreaks for the coming year. However the industry remains concerned with a potential increase in mushroom flies (*Lycoriella mali*) expecting higher numbers in subsequent years.

Specialty Mushrooms

The specialty mushroom industry is comprised of generally small growers, producing oyster and shiitake mushrooms. No formal production statistics are published in Canada. An educated guess would place the combined annual production of oyster and shiitake mushrooms in Ontario between 1 and 2 million pounds at a sales value of between $4 and 8 million. Farmgate price has remained stable for several years. From the chairman's perspective, the specialty industry has overall remained rather stable for the past several years.

Competitor moulds (e.g. green moulds, bacterial blotch, *Penicillium* sp.), and flies continue to be problematic in both oyster and shiitake operations.

Greenhouse Vegetable and Protected Crop value (Millions of $), and production volume (Millions of Kg, or dozen), since 1990

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Greenhouse Vegetables												
Tomatoes ($ M)	25	32	24	33	39	42	55	79	126	145	177	197
kg (000,000)				18	23	31	38	49	80	106	131	145
Cucumbers ($ M)	19	25	23	32	334	41	46	62	77.8	91.9	97.5	104
doz. (000,000				4.4	4.7	5.3	6	8.3	9.8	11.9	12.8	12.9
Lettuce ($ M)	1	1	1	1	1	1	1	1	1	1	1	1
Sweet Peppers ($ M)	3	4	4	4	4	5	11	12	27	27.6	32.7	54

kg (000,000)				*1.5*	*1.3*	1.4	3	4.4	6.7	7.4	9.7	14.9
SUB-TOTAL ($ M) [Greenhouse Vegetables]	48	62	52	70	78	89	113	154	232	266	308	356
Mushrooms ($ M)	76	74	77	85	90	105	102	111	112	117	120	118
kg (000,000)				32	34	40	36.5	36.4	37	37.7	36.2	36.0
TOTAL ($ M)	124	136	129	155	168	194	215	260	344	383	428	524

GREENHOUSE FLORICULTURE

The Ontario floriculture industry continues to show strong growth. Farm gate sales for 2000 were $636 million (Statistics Canada). Ten years ago in 1990, the farm gate sales were given as $246 million. Most of the 260% increase during that period has been produced to service the needs of the export industry, which now accounts for more than half of the total production. Most of the exported plant material comes from the bedding plant and potted plant sectors. The industry in Ontario has a positive export trade balance.

Despite the success, some sectors of the industry are under threat from imported material. In particular, cut flowers are in competition with flowers produced in countries with much lower input costs. Cut flowers from South America can be flown quickly and cheaply into North America and it is estimated that 70% of all cut flowers sold in Ontario are imported.

The above comments demonstrate the global nature of the floriculture industry. One of the reasons for the success of the Ontario industry is its ability to compete on an international level. It follows then, that one of the main threats to the industry is the interference of the free flow of inputs and products across the Canada/US border in both directions.

The concern over the dependence of the industry on the global market is evident from a number of issues that have arisen in the last year.

- Quarantinable diseases (Chrysanthemum White Rust and Sudden Oak Death) even when not occurring in Ontario still have an indirect impact on the industry here. CWR found in British Columbia has the US authorities closely watching chrysanthemum imports from all areas of Canada. SOD in California closed down imports into Canada of a number of ornamental plant species (or plants grown in soil) in the autumn.
- The anti-dumping action brought by the US industry against greenhouse tomato growers, has the floriculture industry concerned that similar action may be taken against them.
- The use of non-tariff trade barriers against exports to the US is also a concern. In the spring and summer of 2001, several flower wholesalers had shipments into the US rejected because of the presence of insects. The shipments were of cut flowers that had been imported from South America, and made up into mixed bouquets in Ontario. The flowers came into North America through Miami where they were inspected by USDA.

They were then shipped to Ontario and a few days later sent back into the US where they were rejected at the border.

Markets

A major factor in market strength over the course of the year was the impact of the September 11th terrorism in New York. Delays at the border in the days and weeks afterwards, and a general slump in sales for several months during the autumn, hurt much of the industry. Potted plants growers estimated a 20% downturn from September through November, a period which included American Thanksgiving, traditionally a very important holiday for Ontario growers. The decrease in sales was not only from reduced orders, but also from customers not taking pre-committed orders. Retail growers close to the US border also suffered from greatly reduced sales as a result of reduced travel by the US public. The cut flower market was also depressed during the same period, but not to the same extent and not for as long a period.

Bedding Plants: The spring market for bedding plants began strongly, but a cool, wet second half of May, slowed sales considerably. Sales picked up again in June, and while not a banner year, most growers felt satisfied with the year. Hanging baskets remain a very important part of the spring crop with most sales concentrated in the early part of May. Growers commented on the increasing importance of branding and on the cost of branded cuttings. It was estimated that the brand name was 25-30% of the cost of the cutting. There were questions over whether the retailer or the buying public was driving the demand for branded plants. Novelty varieties and value added products are also becoming more important. The strength in perennials continues to develop, extending the busy season for many retail garden centres.

Potted flowers: Prices were under some pressure, but in general sales were strong throughout the year with the late year exception noted above. Poinsettias sales at the time of writing are a little behind where most growers hoped to be, but there is still optimism that the season will finish well.

Cut flowers: The major holidays during the spring (Valentines, Easter, Mother's Day) were accompanied by strong sales. The major crops such as chrysanthemums and roses were stable in terms of area planted, although both are under continual pressure from imported material. Rose growers have diversified considerably over the years with most growing alternative crops as well. The increasing importance of snapdragons continues with more acreage being diverted from other cut flowers, and new growers coming into the market. Cut flower growers showed concern about the implications of proposed nutrient management legislation that has the potential to affect them (especially those growing in soil) to a greater extent than potted plant growers.

LOW ACREAGE & SPECIAL CROPS

Crops covered by the Low Acreage and Special Crops Sub-committee include sugar beets, chicory, sweet potatoes, pickling cucumbers, melons, squash, pumpkins, peppers, snap beans, peas, beets, culinary herbs (parsley, cilantro, coriander, baby dill, basil, rosemary etc.) medicinal herbs and asparagus. In the year 2001, these crops were impacted in part by marketing limitations and extremely dry summer weather conditions. Although pest pressure was less pronounced than the previous year, excessive heat caused sunscald on certain crops, namely peppers and cucumbers. Research and extension personnel associated with Low Acreage and Special Crops report similar results as those experienced by growers.

Sugar beets: In the year 2001, some 6,500 acres of sugar beets were grown under contract to a Michigan processor. Growers report a bumper crop, (24 tons/ac) and a high sugar content. Ontario growers are concerned about future availability of herbicides and fungicides for pest control. For the 2002-year, Ontario sugar beet growers have purchased shares into the company and intend to operate as a co-op. It is expected that 10,000 acres will be grown in the year 2002. Sugar-beet research, is supported by Al Hamil, Darren Robinson, Dave Hunt, John Zandstra, Ron Pitblado and An Verhallen.CHICORY:Acreage devoted to processing for inulin extraction was limited to a one acre on-farm trial to examine weed control. There exists need for a strong MU registration program (herbicides) to stay in the market. Approximately 25 acres of chicory was grown, harvested as a root crop for hydroponic forcing into Chicons (leafy salad vegetable). Growers of this niche market crop report seed germination difficulties due to dry weather. A lack of registered herbicides forced costly mechanical cultivation and hand weeding. Qualitech Foods of Tiverton, ON remain optimistic for increased demand for inulin extracted from chicory root thus project an increased acreage for the 2002 year (Columbus).

Sweet potatoes: The 2001 sweet potato crop proved exceptional in terms of yield (8-12000/lb/ac) and quality. More than 220 acres were harvested. Growers are doing a better job in the field, also curing and grading the product. The availability of irrigation on sandy soils certainly proved beneficial. Variety trial research continues under the direction of Al McKeown at the U of Guelph, Simcoe Stn. On farm trials conducted by Cindy and Terry Pieters are also being evaluated for yield and quality, (Columbus) John O'Sullivan continues to evaluate herbicides for sweet potatoes.

Asparagus: The Ontario Asparagus Growers Marketing Board reports an early and heavy 2001 year harvest. Acreage of new better yielding varieties is expanding. Low cost imports, significantly reduced processor demands for canning asparagus thus at times over supply into the fresh market depressed prices. Hybrid seed trials at U. of Guelph, Simcoe Station, were not harvested the 2001 year. In cooperation with the Asparagus Growers Marketing Board, Dave Wolyn continues to lead cultivar evaluation trials. Growers are pushing for breeding of rust resistant varieties.
(see Asparagus Research and Services Sub-committee meeting minutes – attached).

Peppers: Depressed prices over past years, and disease pressure has limited expansion of both fresh market and processing acreage. Growers, research and extension personnel report 2001 yield returns as lower than average. Wind, sunscald, loss of fruit set and frost, contributed to short production. John Warner and staff at AAFC, Harrow Station ,continue to conduct Bell Pepper cultivar trials. John O'Sullivan and staff at U of Guelph, Simcoe Station, continue to study herbicides for peppers, also conduct pepper cultivar trials which include Bell, Hot Banana, Sweet Banana and Jalapeno types. Bob Roy, AAFC Delhi Station, is conducting an irrigation trial.

Beans: Growers, researchers, and extension personnel report that bean yields and quality suffered significantly from extreme dry weather and excessively high temperatures during bloom. Aphid infestations were high which translated into high levels of mosaic viruses. Growers need a sure effective aphidicide to reduce yield losses, (Roddy). Angular Leaf Spot (ALS) of snap beans caused by a fungus Phaeiosuriopsis appeared as a disease in the year 2000. Growth room experiments were conducted at the U of Guelph. During the 2001growing season a fresh market variety trial was established in an ALS infested field. Late summer rains aided the spread of the disease to all 16 varieties. Experiments will continue to be conducted into control of this disease and investigation of label expansion through PMRA URMULE system (Celetti). John Warner and staff at AAFC, Harrow Station, continue to conduct snap bean variety trials including processing, fresh market and large sieve types.

Peas: The majority of the pea crop acreage is dedicated to processing. Processors report a significant need to reduce insect contamination. Chemical control is said to provide limited success, however, research into cultural control of ground beetles and stink bugs should be initiated (Roddy)

Beets: Growers and processors report a reasonably good 2001 beet crop in terms of yield and quality. On some fields, harvesting difficulties were encountered, largely attributed to a wet fall. Beet cultivar observation trials, (early harvest/late harvest) continue to be conducted by John O'Sullivan and staff at U of Guelph, Simcoe Station.

Medicinal herbs: The major herbs grown commercially as a crop in Ontario and considered by the Low Acreage and Special Crops Sub-committee include the Echinacea's, Valerian, St. John's Wart, Lavender, Golden Seal, also those culinary herbs which bear therapeutic or neutracutical properties. Over the course of the past 2 years, growers report depressed prices, however, in recent months over supply of certain herbal products has lessened and price to producers has firmed up somewhat. Ginseng and Medicinal Herb Specialist, Jan Schooley, OMAFRA, Simcoe has compiled a significant amount of information including a herb profile internet page, info sheets, PDF files (forest medicinals) and featured news media reports. It is believed that several jurisdictions may be conducting production and uses research with respect to medicinal herbs, which may be proprietary. Jan Schooley proposes to investigate federal, provincial and university research programs in order to assemble a list of research projects in Ontario.

Culinary herbs: Growers of culinary herbs including rosemary, thyme, chives, savory, basil, mint, oregano, sage, coriander, parsley, cilantro experienced a reasonably good growing season. Pest pressure was reduced compared to the previous year. Leaf hopper created an aster yellows problem in Ontario herbs. Registration of minor use pesticides is very limited. Growers report the need for biological controls as the market demands food safety records from growers to retailers. Agronomic research with respect to culinary herbs remains minimal to non-existent. There exists a need for variety/fertility trials.

Vine Crops (pumpkins/squash/melons): Acreage of vine crops shows steady growth. Most melon growers, continue to express concern over the limited number of virus resistant varieties. The hot dry summer supplemented by irrigation generally produced respectable yields and good quality product. Insecticidal seed treatments are required to control wire worm losses. There exists a great need to replace guthion with a suitable flea beetle insecticide. Powdery mildew continues to be a perennial concern and a systemic control (Nova) would be beneficial. Bee friendly alternatives to insecticides are required to ensure bee survival. Although the acreage of these vine crops is holding steady, producers express concern over reduced yield and a limited number of marketing outlets. Research conducted on melons is non-existent, however John O'Sullivan and staff at U of Guelph, Simcoe Stn. continue to conduct herbicide trials for both pumpkin and squash. Mary Ruth McDonald and staff at U of Guelph, Muck Crop Stn, Kettleby are focussing trials on control of Downy Mildew in pumpkins.

Pickling Cucumbers: Growers met requirements of the processors in the year 2001. Certain areas of the Province experienced water shortages for irrigation. Excessive sunshine and heat caused sun scald. Carpel separation was evident and attributed to poor pollination. The acreage of machine harvested product was down slightly. John O'Sullivan and staff at U of Guelph, Simcoe Stn. continue to lead multi-pick and machine harvest variety trials also herbicide trials. Bob Roy, AAFC, Delhi Stn. in cooperation with Bicks is evaluating pickling cucumber irrigation.

Globe Artichokes: Artichoke seedlings were vernalized and transplanted at two sites, on a muck soil and a mineral soil. At the mineral soil site, one-half of the artichokes were planted on black plastic mulch. Fruit was harvested at the muck station site. No fruit was set at the mineral soil site. This is attributed to devernalization of the plants due to excessive heat. All plants (100%) on the plastic mulch died in early August with no fruit set. The surviving plants on the mineral soil will be covered with straw to determine over wintering possibilities. (McDonald, Vander Kooi, Columbus).

NURSERY/LANDSCAPE & TURFGRASS

The nursery, landscape and turf industries in Ontario are comprised of the production and retailing of shrubs, trees, herbaceous plants and sod, and the maintenance of related landscapes and recreational areas.

In 2000, farm gate sales of nursery stock in Ontario totaled $229,205,000, which accounts for 48% of national sales. This was an increase of about $34,855,000 from sales in 1999. The land base devoted to this production was 16,800 ha, roughly the same as in 1999. Sod sales were $47,109,00 from 4,380 ha (a 10% increase in sales on a slight decrease in land base from 1999). *(Nursery Trades Industry Statistics, Ontario and Canada, 1998-2000 - OMAFRA).* The value of related services in nursery, landscape and turf continue to grow. The industry survey project developed by K. Nentwig has produced an estimate of as much as $6.5 billion for the landscape and retail lawn and garden industry in Ontario, including an unmeasured component from the nursery/landscape/turf industry (public sector parks and horticulture, the golf course industry, florist trade). This is on a farm gate of about $276 million.

The 2001 growing season was characterized by a winter with a duration of snow cover approaching a record length. This was followed by the third extremely dry summer in four years, with many municipal lawn watering bans and low water levels in creeks and streams. There were voluntary reductions in water taking on many of these surface water sources resulting in some limitation on watering on sod farms and golf courses. The fall, in turn, was milder than normal, with warm temperatures. Nursery growers and garden centres reported good sales in a long season.

With the return of dry summer weather in 2001, there are ongoing concerns about water quantity and quality. Potential exists for mandatory water restrictions on nursery/landscape/turf industries if climatic trends continue. Finding qualified labour to deal with increased demand continues to be a problem in these seasonal industries. The lawn care industry appears to have flattened out in terms of growth of opportunities or new operators, and municipal pesticide bans could severely restrict this portion of the industry.

The nursery and garden centre sector had a good year in 2001. The pesticide issue (bans, loss of registrations, development of alternatives) continues to concern this sector. Availability of labour continues to be a problem particularly in the nursery, landscape, and lawn care sectors.

New sports fields and outdoor community recreational areas continue to be developed. There is ongoing concern that the specialized construction requirements for sports fields are often poorly understood or ignored for budgetary reasons, leading to long term problems and even failure of new installations.

The sod industry, as a sector, was strong in 2001. High rainfall in some cases limited the ability to harvest quality sod from poorly drained soil. Demand was high, but sod supply was generally low.

The golf course sector had a good year in 2001, with significantly increased rounds because of the long season. New construction (new courses, renovation) continues to be strong in the golf industry.

One of the main area of concern for 2001 is pesticide use, particularly on turf. In May 2000 the Canadian House of Commons Environment Committee Report (Caccia Report) supported a ban on "cosmetic use of pesticides". Then, in July 2001 the Supreme Court of Canada upheld Hudson, Quebec's right to ban cosmetic use of pesticides on turf in that municipality. There is a huge concern from the lawn care sector including both of the lawn care associations, Landscape Ontario and PLCAO. An umbrella group called Environmental Coalition of Ontario to help fight to retain the right to use pesticides on private and public lands in municipalities.

There is also a continuing concern about loss of chemical registrations (e.g. organophosphate insecticides), and the need to develop low risk alternatives and/or adopt new tools through the minor use system.

The nursery, landscape and turf industry is confident and will continue to make a major contribution to the economy of the province in 2001.

POTATOES

Acreage and Varieties:
There are approximately 275 commercial growers in Ontario who grew about 43,600 acres of potatoes in 2001. About 55% of the acreage is for the tablestock market and 45% for the processing market.
The main potato-production areas in the province are Alliston, Shelburne, Leamington, Ancaster, Simcoe-Scotland-Burford, Grand Bend and Mount Albert. Potato production is also located in northern areas such as Thunder Bay and Sudbury.
The main varieties grown for the fresh or tablestock market are Superior, Yukon Gold, Cherokee, Kennebec, Norland, Chieftain and Goldrush.
Due to processors' demands, the chipstock market has seen a turn around of varieties. Snowden, which used to be the standard variety for potato chips, is now being replaced by proprietary Frito-Lay varieties.
Shepody continues to be the main variety grown in the Shelburne area for the processing market, ie. for soups, stews and pre-peel sales.

Ontario Potato Board.

The Ontario Potato Board continues to play a critical role on addressing marketing issues and on determining research priorities for the potato industry
The Board General Manager is Don Brubacher and Wayne Dorsey is the Chairman. The field man is Kevin Marcoux.

Seed Potato Industry in Ontario.

Although most Ontario seed-potato growers are members of the Ontario Potato Board, they continue to be represented by their own Association, the *Ontario Seed Potato Growers' Association* (OSPGA). In 2001, certified acreage was approximately 1000 acres.

Seed sales to commercial growers were brisk with generally good field performance.

The Association offers 30 different potato varieties to commercial growers and sales look promising for spring 2002.

Frito Lay, the largest potato chip processor in Ontario, is granting more contracts for exclusive use of Frito Lay seed lines from their private seed company. A couple of Ontario seed growers are now increasing these FL lines for seed.

The Ontario Seed Potato Growers Association (OSPGA), the Ontario Potato Board and a German biotech company, MPB Cologne, are working to develop an Industrial Tuber industry in Ontario using the SPUD Unit to rapidly multiply transgenic potatoes. This new "life science" industry will be able to produce large quantities of recombinant proteins for technical, diagnostic and eventually biomedical and therapeutic applications. Biofarming will help Ontario potato producers diversify into a higher value crop.

Production Problems in 2001.

Last year will be remembered as the wettest growing season on record; 2001 will be remembered as the driest and hottest. The Simcoe-Delhi area was the hardest hit. No rain fell for 7 weeks, and soil temperatures were above 100F for weeks. Growers with irrigation tried to keep up with crop needs, but in a day or two irrigated fields were as dry as they had been before being irrigated. Hot, humid weather made moving pipes an arduous task.

When night temperatures as well as day temperatures were high, the potato plants wilted and no growth occurred during these hot periods because the energy produced during the day was respired away at night, not translocated to the tubers.

Drought, hot weather and air pollution kept the potato crop under stress for most of the growing season. This reduced marketable yield from 25% to 50% depending upon the field.

The hot, dry weather caused other problems for the crop. The following is a summary of those problems and some general observations on the growing season:

Weed Escapes: Weeds, especially lambsquarters, were a problem in many fields because there was not enough soil moisture to activate pre-emergent herbicides

Air Pollution: Hot, hazy days predisposed potato plants to injury from air pollution. Damage depended on the chemicals present and their concentration.

Scab: Scab was more widespread this season due to the dry weather. High soil moisture at tuber initiation tends to reduce the incidence of scab.

Early Blight: The emergency registration of Quadris, which was requested by the Potato Board, allowed growers to protect the crop from early blight. The incidence of early blight is severe when the crop is under stress and it could have devastated the crop if Quadris would not have been available.

Poor Growth Due To High Salt Content In The Soil: This problem was observed in many fields in the province. In dry years, sodium salts move up from lower levels in the soil profile as soil moisture rises. The salt injures root tips and root hairs which reduces the ability of plants to take up soil nutrients resulting in poor plant growth.

Leafhoppers: This insect infested fields each time that there was a heat wave. When temperatures increased, leafhoppers would move from weeds or alfalfa fields to potato fields in search of a cooler environment. Lagon provided good control of this pest.

Colorado Potato Beetle: Admire provided good control of all CPB stages. There were no signs of CPB insecticide resistance.
Variety Performance: In contrast to Andover and Superior which had to be irrigated every week, Yukon Gold showed its drought tolerance. Snowden grew long stolons that developed into small plants on the side of hills. Chieftain developed heat necrosis in a few sandy fields. Cherokees showed some heat sprouting in early August
Harvest: The hot and dry summer was followed by a wet fall which delayed harvest. This problem has been more serious in the Shelburne area where heavier soils dry more slowly.
Yield: It is a fact that potatoes require about an inch of water per week to produce a good yield. About 60% of the potato acreage is under irrigation and drought had a tremendous impact on yield. In non- irrigated fields, yields were down by 35% to 50% depending upon the field. As a consequence, the provincial potato yield is down. The Ontario Potato Board estimated that the 2001 average potato yield in the province is about 185 cwt/acre. The 5-year average provincial yield is 215cwt/acre.
Thus, the 2001 yield is down by 14% when compared to the 5-year average yield.

Quality: The quality of the 2001 crop is excellent. Many tuber defects or diseases that develop in wet seasons such as hollow heart, internal brown discoloration, late blight, soft rot, etc. are not a problem this year.
Dry matter is high in processing varieties.

Prices
Processing Crop. A recent cost of production study concluded that potato growers were no longer covering their costs of production. Over the years prices had been fairly flat and in some cases they have come down. The Ontario Potato Board responded to this study by pursuing a price increase for growers. No price agreement was reached between the Potato Board and processors at the several negotiation meetings that were held in January-February. To solve the problem, six individual contracts were taken to final arbitration. Each individual case was heard separately, and in all six cases arbitration went in favor of the growers.
Although the ruling went in the growers' favour, processors appealed by putting their case before the courts. The hearing was postponed a couple of times and in the meantime, Hostess Frito Lay and Super Pufft reached a 3-year agreement with the Board.. It is expected that the other processing companies and the Potato Board will also reach an agreement. Growers who grow potatoes for the open market have been shipping processing potatoes to the U.S.

Tablestock prices. The price of tablestock potatoes is higher this year when compared to last year's prices. A shortage of potatoes is expected for the winter months because drought also affected other Canadian provinces and the US. This should keep the tablestock potato prices up.

The Integrated Pest Management Program.
A total of 20 scouts monitored approximately 13,000 acres of potatoes in Simcoe and Dufferin counties. The scouts were trained by the OMAFRA Potato Specialist. The salary of the scouts was paid by the growers. In 20001 the Rural Youth Job Strategy Fund

program provided some funding for the scouting program to the growers' associations to offset part of the cost of salaries.

ROOT, BULB AND LEAFY VEGETABLES

The root, bulb and leafy vegetable sector of the horticultural industry is a progressive industry willing to adopt new technologies and approaches to dealing with the challenges that the industry faces. This sector is proud of the quality of its growers and their produce. The industry is benefited by its close proximity to large population bases, by the low Canadian dollar which is advantageous for exports to the United States, and by soils and a climate that enable the production of high quality vegetable crops.

There is a continuing trend for traditional production areas of onions, carrots and lettuce to become more heavily utilized in the production of Asian vegetables and processing celery, while acreages of the traditional muck crops (in particular, carrots and onions) are increasing on mineral soils. It is believed that total acreages in these crops will remain relatively static over the next 5 year period, but that the number of growers of these crops will likely decrease.

The root, bulb and leafy vegetable sector is willing to embrace new opportunities for value-added products (slivered, diced and frozen onions, carrot juice, etc.), and new niche-market crops (Asian vegetables, nutritionally enhanced vegetables, etc). This sector has the potential to turn current concerns over food safety to its advantage through strategic marketing that emphasizes our ability to deliver high quality, safe produce. However, there is a general concern about who will bear the costs of implementing legislated food safety and nutrient management programs and uncertainties as to whether the requirements of these programs will be suitable for vegetable production.

The progress of the root, bulb and leafy vegetable sector towards these goals is hampered by the erosion of crop scouting IPM programs and by lack of access to new environmentally-friendly, reduced-risk and biopesticide-type products. The industry is thus forced to rely on older organophosphate and carbamate products with less favourable environmental and health profiles. However, competitors, particularly those in the US, have access to these improved products and are governed by different standards for importing their produce to Ontario than Ontario growers must meet. Lack of a political vision for agriculture at both the federal and provincial levels has led to decreased support for the industry, in terms of income protection programs for growers, and support for researchers and research funding. There are jurisdictional inequalities (e.g. Quebec vs. Ontario) in terms of the level of support provided provincially to growers. Growers are frustrated by the NISA system, due to a lack of timeliness in program announcements and payments made to growers. This negatively impacts on the ability of growers to make critical decisions about approaching growing seasons. Due to the lack of credit available from many banking establishments, increasing numbers of growers are using their input suppliers as sources of credit. Government support is critical to the ability of this sector to compete, particularly as it includes a wide variety of crops, many of which are grown on small acreages.

The root, bulb and leafy vegetable sector has been negatively affected by the amalgamation of major grocery chains and by the globalization of the marketplace, which has led to the loss of loyal and reliable markets and to the need to compete with growers from all corners of the world. In addition, the local packing house marketing system used in some regions of the province is unable to adequately stabilize prices and to organize the even distribution and release of produce throughout the year. It is felt that there may be an increasing shift towards grower-packer operations over the next 5 years.

SWEET CORN

Sweet corn continues to be the top acreage crop in Ontario, with over 43,000 acres established in 2000 (Table 1). Over the past 5 years in Ontario there has been a slight trend towards decreased acreage with a stronger trend towards decreased farm gate value. This corresponds with national sweet corn trends. In 2000 the Canadian farm gate value of sweet corn declined by 22% for fresh market and 30% for processing from 1999.

Table 1: Top 10 Vegetable Crops in Ontario - 2000. Source: OMAFRA Website.

Top 10 Vegetable Crops (Acreage):		**Top 10 Vegetable Crops (Value):**	
1.Sweet Corn	1. **(43,120)**	1.Tomatoes	1. ($47 million)
1.2. Peas	1. (23,515)	1. 2. Cole Crops	1. ($27.9 million)
1.3. Tomatoes	1. (17,925)	1. 3. Onions	1. ($21.4 million)
1.4. Cucumbers	1. (10,190)	**1.4. Sweet Corn**	**1.($16.5 million)**
1.5. Cole Crops	1. (9,810)	1. 5. Carrots	1. ($15.6 million)
1.6. Onions	1. (7,200)	1. 6. Cucumbers	1. ($13.8 million)
1.7. Carrots	1. (6,615)	1. 7. Peas	1. ($10.5 million)
1.8. Beans	1. (6,215)	1. 8. Peppers	1. ($8.8 million)
1.9. Peppers	1. (4,005)	1. 9. Pumpkins & Squash	1. ($7.2 million)
1.10. Pumpkins & Squash	1. (3,200)	1. 10. Beans	1. ($7 million)

Roughly 75% of the Ontario Sweet Corn acreage is for processing, which is the same as the national processing sweet corn proportion. Processed sweet corn products are included in the top 5 processed vegetable exports (Table 2).

Table 2: Canada's Top 5 Processed Vegetable Exports. Source:

	Product	Value ($)
1	Tomato Ketchup	30 million
2	Sweet Corn (Canned)	29 million
3	Sweet Corn (Frozen)	20 million
4	Pickles	17 million
5	Frozen Mixed Vegetable	14 million

2001 Seasonal Summary

The first fresh market sweet corn hit the market during the first week of July, although there wasn't any significant volume until the week of the 16th of July. As usual, early season prices were good ($14 - $20 per 5 dozen bag), but it didn't last long! By the 3rd week of July the price at the terminal had dropped below $10 per bag and stayed in the $6-10 range until early September, dropping as low as $5.50 at times. 2000 prices at the terminal never dropped below $10, and were usually in the $10-15 range. Low 2001 prices were due in part to increased acreage over 2000.

Early season planting conditions were excellent. However, 2 weeks of steady rain in late May set the early crop back and resulted in higher than average losses due to 3-5 leaf die-back. Unusually high levels of urea burn in both field and sweet corn fields that had emerged just prior to the rains were noted in 2001

Non-irrigated fresh market yields were lower than average due to the dry weather conditions. Even where irrigation was available, higher value vegetable crops were usually given priority.

Processing yields at the start of the season were very low, with small cob size and below average recovery at the plant. The scattered rains of mid-August were will-timed for the late crop, with September and October yields coming in at average levels. There was extreme variability in yields both across the province and in any given area. A 7 km. distance between locations could easily mean a 50% yield difference. Prince Edward County was hit particularly hard.

Despite the mild winter and predictions for a high early season Stewart's Wilt pressure, presence in the field was actually quite low. This may be due to cool wet conditions during late May. Rust barely made a mark this year, after being seriously affected the sweet corn crop in 2000. There is still need for concern over the new strain of Rp1D resistant rust. All growers should be scouting fields from the mid-whorl stage onwards if weather conditions are conducive to rust development.

Wireworm losses were unusually high this spring, even in fields with a long history of continuous row crops. Wire worm and cutworm populations were also especially high in earlier planted fields. European Corn Borer and Corn Earworm levels were average. Many fresh market (and processing growers) miss having access to a provincial network of sweet corn moth trap counts.

Aphids are an annual problem for fresh market growers. The availability of suitable control options is a big issue. Pirimor treated produce can not be exported to the USA and the days to harvest interval for Orthene (21 days) is too long to be of use for aphid control.

Post emergence weed control remains a big issue, especially for the later germinating annual grasses, such as proso millet, crab grass and fall panicum.

TENDER FRUIT

The summer of 2001 had an extended period of hot dry weather which is not typical for the tender fruit areas of Ontario. The above-normal rainfall in May enabled most of the early tender fruit crops to get through the extremely dry weather experienced in June, July and August. At Vineland Station, 21.6 mm of rain fell on May 22, and the next significant rainfall (25.4 mm) was on August 19. During this period, there were only 8 days when rainfall exceeded 5 mm, and none with more than 10 mm. During a critical phase of fruit growth and development (June 12 to August 18), there were no significant rain days, although some areas did benefit from isolated thunderstorms that dumped 25 to 50 mm in localized areas.

Monthly temperatures were generally warmer than normal. Heat units (both Base 5 □C and Base 10 □C) were higher during the early part of the season (April through June), leading to tremendous early growth and development. July was slightly cooler, resulting in lower than normal heat units, but August was again warmer with a higher heat unit accumulation.

Most major fruit crops came through with outstanding quality and good yields. Accessibility to water was a key factor in quality and quantity of production. Without irrigation, many tender fruit crops had difficulty reaching acceptable marketable fruit size, and there is some concern for the overall health of trees which were not irrigated. October rains have replenished soil moisture and most trees are going into the 2001-2002 winter in good shape.

Fresh Market

Fresh peach volumes were up, with higher average returns per tonne. As the US industry moves to 2 ½" sized peaches as standard, smaller sizes, including the 2¼" category are difficult to sell even at discounted prices. The nectarine crop was down with lighter fruit set and smaller sizes.

There was a strong fresh market for Bartlett pears under the 'Basket Pear Incentive Program', though bushel sales remained relatively, reflecting the smaller size range due to the drought. Prices for Bosc pears rebounded, but higher proportions of fruit in the smaller size ranges resulted from the drought conditions.

Yellow plum volumes were up, but returns per tonne were relatively unchanged from 2000. Key factors are the popularity of 1.5 L baskets and the continued effectiveness of the 'Yellow Plum Incentive Program'. Blue plums and prunes declined, mainly because there is no effective control for black knot.

Sweet cherry production was adversely affected by spring frosts in some areas. Ontario cherries were sold in retail packs, but there was some confusion over size of packs: it appears that the 1 pound clamshell will become the standard.

For many crops, packaging was used to differentiate Ontario produce from US imports.

Processing Crops

Although clingstone peach tonnage processed again surpassed previous records, the Ontario crop was down 9% due to smaller fruit size resulting from drought conditions. Good weather enabled growers to delay harvest until the fruit was more ripe than usual and so obtain larger fruit size. The processing shortfall was made up with increased imports, and 2001 was the first year that imports exceeded domestic production. Demand is strong, with strong product sales. Nabisco/Kraft has embarked on an aggressive planting program to ensure long-term supply of processing clingstone peaches from Ontario growers

The processing pear crop was down due to lighter fruit set and smaller fruit size, with fewer pear orchards having access to irrigation. Domestic production supplied only about 30% of processing requirements. A new weight size grading system was tested in 2001 to eliminate on-farm grading prior to delivery. There is potential for up to 1000 tonnes of machine-harvested Bartlett pears for processing in September prior to development significant storage losses.

Nabisco/Kraft Raw Product Summary

Product	**Source**	**Tons processed**			
		1998	**1999**	**2000**	**2001**
Cling Peaches	Domestic	6223	6985	7405	7087
	Imports	3,241	5,393	5,697	7369
	Total	**9,464**	**12,377**	**13,102**	**1445**
Processing Pears	Domestic	3,066	3728	5,178	3021
	Imports	6,366	9,277	6,666	7746
	Total	**9,432**	**13,005**	**11,844**	**10857**
Total Raw Fruit	Domestic	9,289	10,713	12,583	10028
	Imports	9,607	14,670	12,363	15261
	Total	**18896**	**25382**	**24946**	**25312**

Although Heinz (Leamington) is indicating they will no longer process pears for their baby food pack, Nabisco/Kraft will be able to provide a firm market for their continued production.

Sour cherry crop was down due to spring frosts, and sweet cherries for brining
Fruit volumes marketed through Ontario Dealer Shippers (Source: OTFPMB)

Nursery

The availability of trees for planting outside the PPV quarantine zone is the most challenging issue facing the nursery industry, especially sourcing budwood outside the quarantine zone. For fresh market cultivars, source trees have been identified and tested by CFIA, but the biggest gap is for processing clings for south-western Ontario. A Prunus certification program has been initiated (see TFRSSC recommendation 2000-7) that will address the short-term and long-term needs relative to adequate supplies of virus-tested nursery stock. Importation of trees from the US are a concern re virus testing standards especially for PPV.

Plum pox

In surveys conducted in 2001, fewer positive samples were found compared to 2000, reflecting the eradication of infected trees last year. Eradication continues to be the objective. Outside the quarantine zone, entire orchards were removed if a positive was found. Inside the quarantine zone, only trees or groups of trees were removed, and entire orchards were removed only if infection rate exceeded 10%. A new quarantine zone was established in the Stony Creek area.

Alternate hosts were also surveyed in 2001. No infected samples were found in commercial nurseries of ornamental *Prunus* and walnut. One residential site contained a PPV-infected dwarf flowering almond, and further tests are being conducted to confirm infection. A number of native plant species with 'suspicious' results will be tested in 2002 using aphid transmission and mechanical inoculation to confirm susceptibility to PPV.

Pest monitoring (Consultant)

Observations included:

- Oblique banded leaf roller (OBLR): Increased activity in tree fruit especially pears. Observations on pest development did not match predictive models, indicating a need for additional work on monitoring techniques and modelling. Limited number of products available for control.

- Plum curculio (PC): increased injury on peaches found around periphery of orchards especially where insecticide intervals are long (between 1st and 2nd generation OFM spray dates), also in OFM mating disruption sites. Need to develop a strategy that will maintain integrity of peach IPM program.

- Green weevil: populations increasing from prior years. Many sites had leaf injury, and growers were concerned where more than 25% of terminals were damaged. No fruit injury detected, but little available information on fruit injury potential.

- Pear blossom midge detected sporadically in some orchards, and there are no registered control products. Timing of pear sawfly controls needs to be better defined.

TOMATOES

The 2001 crop year can be summed up as dry. This is in contrast to the very wet growing season encountered in 2000. Growers seem better able to handle drought than flooding conditions. This is reflected in improved yields for 2001 compared to 2000. Irrigation is expected to become more widely used in the future and availability of water and water quality will become more of an issue. Although diseases were not a particular concern in 2001 because of dry conditions, control of bacterial diseases remains a high priority for both processing and fresh market growers. The Ontario breeding program (Univ. of Guelph, Ridgetown College & AAFC Harrow) has been a key factor in maintaining the competitiveness of the processing industry and has played a major role in yield and quality advances made over the last 10-15 years. The breeding and cultivar development program currently in place should be continued. Development of technology which moves production earlier in the season is also seen as important.

Processing tomato production is expected to increase slightly over the next 5 years. Processing yields are also expected to increase, partly due to an increase in the use of irrigation. The number of growers may decrease. Fresh market acreage and production is expected to remain stable.

The combined farm value for both processing and fresh market tomatoes in Ontario for 2000 was $56,078,000. This represents a decrease of approximately 18.4% from the 1999 value of $68,691,000. Although figures are not available for 2001, the combined farm value should increase due to higher yields and an increase in the processing acreage in 2001 compared to 2000.

a) Processing Tomatoes

Table 1. Recent trends in the Processing tomato industry in Ontario: (Sources: OPVG, OMAFRA Publication 20 and OMAFRA website)

Year	Contracts	Measured Acres	Processed Tonnage*	Avg. Yield (tons/ac)	Gross Farm Value
1992	289	17,270	420,000	24.2	$43,492,000
1993	275	19,206	510,000	26.5	$53,040,000
1994	237	19,834	575,000	28.9	$59,336,000
1995	228	18,578	578,000	31.0	$60,619,000
1996	222	15,940	502,000	31.2	$52,475,000
1997	192	14,800	497,000	33.3	$50,310,000

1998	183	15,060	562,000	37.0	$58,942,000
1999	187	16,680	545,000	32.0	$57,291,000
2000	173	15,810	450,000	28.4	$44,238,000
2001(p)	173	16,822	533,625	31.6	N/A

* includes fresh market acreage.

Processing tomato yields were reported in at 31.6 tons per acre in 2001. This was up 11.3 % from 2000 and just below the 5 year average yield of 32.5 tons per acre. Processors reported a good quality crop in 2001 with high soluble solids, good fruit colour and good paste recovery. Some early fields had poor yields and blossom end rot was a concern at the beginning of the season. Irrigated fields had very good yields. There were some problems with split set at the end of the season. Spring frost caused some acreage to be replanted and fall frost also accounted for some unharvested acreage at the end of the season.

b) Fresh Market Tomatoes

In spite of dry weather, 2001 was considered a fairly good year for fresh market tomatoes. Yield and prices were reported to be fair to good. Other than dry weather which was handled by irrigation, there were no particular growing problems in 2001. The concern raised last year about greenhouse tomatoes being packed and sold as field tomatoes was present again in 2001. Some greenhouse growers offer tomatoes at reduced prices when cleaning out their greenhouses which may hurt the price of early fresh market field tomatoes.

Table 2. Recent trends in the Fresh Market tomato industry in Ontario: (Source: OMAFRA Publication 20 and OMAFRA website)

Year	Harvested Acres	Farm Value
1992	7,500	$32,055,000
1993	5,910	$43,633,000
1994	6,308	$36,705,000
1995	5,217	$26,454,000
1996	5,714	$22,603,000
1997	5,500	$19,800,000
1998	2,325	$10,866,000
1999	2,200	$11,400,000
2000	2,115	$11,840,000
2001	N/A	N/A

EMERGING ISSUES

AGROFORESTRY

1.Projected Increase In Demand for Source-Identified Nursery Stock For Tree Planting Programs

Over the past several years, public policy officials have developed an increased awareness regarding the value of trees in meeting environmental management objectives. In particular, there is growing interest in tree planting initiatives which would be specifically tailored to address societal and on-farm issues. These issues include global warming, nutrient management, maintaining water quality and quality, retirement of fragile lands and others.

However, it is evident that Ontario lacks the infrastructure to deliver large quantities of good quality, source-identified seed. There is an immediate need to develop a comprehensive provincial policy designed to guide tree planting programs in the future (Refer to Research and Service Recommendations).

2.Possible Adverse Effects of Global Warming on the Maple Industry

A recent study in New England, indicated that temperatures during the sugaring season have warmed by about 3.0 degrees F° or more in Rhode Island, Vermont and New Hampshire in the past 100 years. According to a Maple Case Study, maple syrup production in New England declined significantly in the past 100 years. Approximately 33% of this reduction was attributed to climate change.

Because the maple season is confined to a few weeks in the spring, it is potentially quite vulnerable to the potential affects of global warming including extreme fluctuations in temperature. In fact, long-term monitoring of maple production at the regional level, could provide an excellent barometer of the effects of climate change.

Discussions should begin to evaluate the need for long-term monitoring of weather patterns and their impact on the health and productivity of sugar bushes.

3.Sweet Chestnuts for Forests and Managed Orchards

Dr. Adam Dale of H.E.S. Simcoe, University of Guelph has identified a plant breeding opportunity to incorporate genetic resistance to chestnut blight disease into native Canadian sweet chestnuts. The project would require a long-term commitment of 20 years to develop the first resistant progeny. The project would initially focus on forest sweet chestnuts, which could also be adapted for use in managed orchards. The Trillium Foundation has provided some initial funding for the project in 2001. The Canadian Food Inspection Agency and MNR have been made aware of the project. Although some mild tolerance to blight infection may be present, there are currently no known sources of resistant sweet chestnuts in North America.

4.Grafted Black Walnut Cultivars

A project has been discussed and submitted independent of SONG (south west) to establish a managed orchard on private land to evaluate several selected old cultivars of native black walnuts. The named or numbered walnut cultivars are maintained at an orchard museum at the University of Lincoln ,Nebraska called the "Dr. Cyril Bish Nut Orchard Museum". Budwood of these selections can be ordered for grafting purposes. One nursery in Niagara offers several of these cultivars for sale as grafted true-to-name trees. This project would be considered additional to the cultivator study already in progress at HES Simcoe involving sweet chestnuts and japanese heartnuts. The project may also be in line for funding after the Sweet Chestnut breeding project as described above which has also been initiated during 2001. There are a number of private growers already testing native walnut cultivars on their own land. Native black walnuts have not been identified by SONG(south west) as having market potential but they have been discussed by the Northern Nut Growers Association as having potential value. Any new walnut industry will be competing with established commercial walnut industries of Washington, California and Oregon.

APICULTURE & POLLINATION

Resistance of Varroa mites especially in the Cornwall Area as resistant mites Move across the border in the first areas of entry of Varroa into Ontario. Resistant mites will probably appear in Niagara, Essex and Lambton areas within the next two years. No other chemical control is currently available.

Possible Solutions
1.Register Choum phos
2.Register or obtain similar exemption for Oxalic Acid as Formic Acid
3.Through extension have beekeepers adopt screened bottom boards to give about 40% control of Varroa
4.Through extension have beekeepers adopt putting two shallow frames in each brood chamber and cut off the drone comb that the bees build to give about 40% control of Varroa

Resistance of American Foulbrood (AFB) to the only registered chemical – Oxytetracycline

Possible Solutions
1.Register both Tylosin and Lincomycin in Canada.
2.Continue to monitor the susceptibility to Oxytetracycline of colonies that breakdown with AFB and destroy them by fire or irradiate them.
3.Through the Tech Transfer Program continue to develop hygienic stocks of bees with the Ontario Bee Breeders.
4.Through the Tech Transfer Program continue to develop the Harbo suppression of mite reproduction trait in the Ontario Bee Breeder's stock.
5.Through extension have beekeepers adopt changing their stock over to the HBTM resistant, hygienic and suppression of mite reproduction stocks that are available from the Ontario Bee Breeders

APPLES

1.Disarray in the industry caused by the dissolution of the OAMC

- loss of Market share and shelf space at the retail level
- Disruption of market research
- Loss of funding mechanism for producers to access government funding for research and special projects through matching funds formula

2.Economic Health and Vitality of the Industry
- Government support in other Provinces and States affect the Competitiveness of the Ontario Industry
- Downloading of services impacting producers bottom line
- Commodity prices for the bulk of the crop continue below COP

3.Erosion of person Years and FTE's dedicated to apple extension and research
- research vacancies at AAFC Vineland
- Reduction in person years for apples @ U. of G.
- Reduction of person years and experience for apples at OMAFRA

Strategic Problems / Issues

4.Impact of pesticide re-evaluation
- PMRA decision re: streptomycin
- No alternative control currently available, new strategies, materials urgently needed

5.Sustainable Management Practices for :
- Oblique banded leaf roller

  - Oriental Fruit Moth
  - Dogwood Borer
  - European Apple sawfly

6.Integrated management of fruit diseases and associated pathogens

7.Continuity of Cultivar Evaluations
  - Apple Commission funding disrupted
  - Person years devoted to apples at OMAFRA and U of G. reduced

8.Post harvest Disease Complex
  - Few control measures available
  - Current controls for storage rots not effective

9.Product Registration Issues
  - Minor Use Pesticide registration wish list
  - Pesticide review impacts
  - Registration delays e.g. 1- MCP

GINSENG

1.Export of seed to Asian countries: North American seed is being used to produce crops that compete directly with ginseng grown in North America. China requires a continuous supply of seed from North America to support production as a result of low viability of *P. quinquefolius* seed grown in China.

2.HACCP-based production protocols: To improve the quality of Ontario ginseng roots, production practices need to be tied to a HACCP-based system.

3.The incidence of Rusty Root is increasing: It is becoming imperative to identify the environmental causes of Rusty Root in ginseng. Growers need a means of evaluating production practices to reduce the incidence of rusty root.

4.Consignment of root to buyers in Hong Kong may threaten market stability. Approximately 1/3 of Ontario root has been consigned.

5.Irrigation of ginseng gardens: Research is needed to examine the usefulness of irrigating to lower garden temperatures. As climatic change brings about warmer summers, seed set in ginseng gardens is threatened.

6.Nitrogen, macro/micro nutrients and manure use in ginseng: Research is needed to identify appropriate addition of manure to ginseng sites in the preplant year. Crop removal of N and the impact of other nutrients need to be better understood to make optimum use of these inputs. It is becoming evident that gardens where nutrition is "pushed" experience additional disease problems.

7. Site selection: Because of the ginseng replant problem, good sites are becoming more difficult to obtain. Many growers lease land for ginseng production and soil properties and herbicide residues can have an adverse affect on ginseng.

8. Repeated requests for the emergency use of Quadris on ginseng: Until the Quadris URMULE is approved, the ginseng industry will require repeated emergency use permits. This need is market-driven and has a profound impact on marketability of Ontario ginseng roots.

9. Potential for scouting through AIMS: The development of a scouting program through AIMS would enable growers to identify problem areas before they spread. To be workable this would need to be coupled with rapid, accurate disease diagnosis.

GREENHOUSE AND PROTECTION CROPS

GREENHOUSE VEGETABLES

1. Trade dispute with the USA greenhouse tomato growers & general marketing problems
2. Phytosanitary certification requirements
3. High natural gas cost
4. Environmental issues (nutrients, boilers etc)
5. New diseases and invasive new pests
6. Labour – need for 6 month/6month labour availability year round. Assistance required in December & January.

MUSHROOMS

Commercial Mushrooms

Two of the three major concerns from previous years continue to hold attention. Mushroom growers are currently focussed on; 1) environmental issues developing from urban encroachment, which include odours generated from the composting process and 2) nutrient management, especially in the management of waste water. A previous concern regarding the shortage of farm labor has been dropped in importance to a 4th concern.

The 3rd concern raised is the consequence of the loss of the fungicide Benlate, a product used successfully as a management tool for the control of the green mold diseases caused by Trichoderma spp. It has been noted this disease complex has increased once again in Ontario.

Two emerging issues are first the consequence of using Citation in either compost or casing soil and its effect on the environment re spent compost and a marketing concern with the anticipated increase in Phase III substrate availability to Ontario growers and its impact on the market especially following the slow down in the US market after September 11th.

Specialty Mushrooms

The three major concerns are, 1) lack of quality at the retail level, 2) the farm products should be priced at a level to retain a competent work force through competitive salaries with other sectors of society, which ties in with the third concern, 3) shortage of farm labor.

NURSERY/LANDSCAPE & TURFGRASS

Nutrient management guidelines

The committee identified availability of detailed nutrient management guidelines for nursery and turf crops as a critical need, especially in the light of potential application of mandatory nutrient management regulations. Proper application of well defined nutrient management guidelines will also protect ground water quality. There are gaps in the basic research in terms of detailed guidelines by crop, both in nursery and turf production. Development and publication of guidelines, based on new research where necessary, will be critical to application of best management practices in nursery, landscape, and turf production.

Pesticide bans, pesticide use and alternatives (e.g. integrated pest management.)

The political and regulatory climate around pesticide use, and particularly the potential imminent municipal pesticide bans, requires continued research into reduction in pesticide use, including improvements in IPM methods for all nursery/landscape/ turf sectors (monitoring methods and thresholds, certification). There is also a critical need to pursue alternative pest control methods (biologicals, etc.) to provide low risk alternatives.

Water use and management

With the return of a long, hot, dry summer in 2001, there continue to be long term concerns about water supply, use, and conservation. Water was identified again as an emerging issue in the nursery, landscape and turf sector. Approaches to dealing with this issue are suggested in the research priority adopted by the subcommittee (Water Quality and Quantity, below). There is increasing need for technology transfer to improve choice and proper use of irrigation equipment and proper irrigation scheduling, as well as tools and training to meet the regulatory requirements for water quality and quantity conservation.

Acquisition of industry data; coordination of research

The committee has once again identified the importance of accurate and up-to-date industry data to the ongoing health of the nursery, landscape and turf industry. The two particular areas that were emphasized were economic data, which will affect decision making about regulation and funding, and pesticide use data (both for the industry and the general public) which is seen to be lacking in the current discussion about pesticide regulation/bans at the municipal level. A related issue identified by the committee is the coordination of effort in matching research needs, funding, and researchers.

POTATOES

1. **Water Management and Quality.** Water availability, quality and management is a serious issue in the province. The potential establishment of regulations related to irrigation water is a concern for potato growers. Regulations that do not take into consideration the crop critical periods of water requirement could cause serious economic losses for growers.

2. **Food Safety.** Processors, packing plants or others in the food production and distribution chain may soon request a record of production practices with every load of potatoes to address food-safety concerns.

3. **Phytosanitary certificates required to export potatoes to the US.** Potato growers who export processing potatoes to the US must provide a phytosanitary certificate for each load being shipped. The lack of CFIA personnel to conduct the inspection necessary to issue a phytosanitary certificate and the cost involved is a serious concern for many processing growers.

4. **Potato Wart.** In October 2000, some tubers infected with potato wart were found in a small section of a 62-acre field in PEI. Potato wart caused by the fungus Synchitrium endobioticum is a quarantinable disease, and Federal Quarantinable Regulations apply to fields where the disease is found. As a result of cooperative efforts between Canadian and US officials, the most rigid restrictions imposed immediately after wart was found have been removed. PEI potatoes have now limited access to US markets with more relaxed export requirements.

ROOT, BULB AND LEAFY VEGETABLES

The following changes have occurred to the emerging issues:

1. The pea leafminer, reported in 1999 as an emerging issue, is now a current issue.
2. The potential loss of *Fusarium* resistant cultivars of celery due to company restructuring is no longer a concern, and has been removed from the list of emerging issues.
3. The presence of new races of downy mildew on spinach, which current spinach varieties are not resistant to, is a new emerging issue.
4. Increasing occurrences of herbicide-resistant weeds, is a new emerging issue.

SWEET CORN

1. Acceptance of Transgenic Technology.

While this issue is not "emerging", it continues to be an issue for the sweet corn industry. Transgenic sweet corn could have a major impact on the sweet corn industry. Transgenic cultivars are a positive tool for growers, in terms of better insect control, area-wide suppression of corn borers, and more effective weed control. Processors no longer grow any Bt corn for fear of jeopardizing export markets. Bt sweet corn continues to be grown by fresh market growers and sold without problems.

2. Disposal of Plastic Mulches.

While it presently is not a problem, there is concern that in the future landfills may refuse to accept agricultural plastic waste. Recycling of this type of material is difficult because of it is often dirty.

3. Food Safety.

With increased emphasis on food safety in the marketplace, some concerns are being raised about food safety in the sweet corn industry. In particular, are questions about chlorine levels in wash water, proper disposal of chlorinated water, and proper management of water used for hydrocooling. While growers try to maintain sanitary conditions when handling their produce, concern was raised about sanitation in some of the distribution centers (eg: Ontario Food Terminal).

4. Declining Research Funds and Personnel.

Research funds are becoming harder to find, especially for commodity groups with no grower organization. Research and extension personnel are also in decline, which is a concern.

5. Handling of Sweet Corn at the Retail Level.

Concern was expressed about the way Ontario sweet corn was handled at the retail level. It was felt that retailers need to be educated on how to handle sweet corn in order to maintain quality. Poor quality produce at the retail level reflects poorly on the entire industry. Often product is stored at the warehouse for unacceptable time periods without proper cooling (especially a problem with early season Se varieties.)

6. Coordination Between Bee and Sweet Corn Industries.

Progress has been made in identifying bee hives near sweet corn fields; however some beekeepers do not identify hive locations clearly enough, or the list of local beekeepers is outdated. Negative publicity about bee kills are an ongoing concern and frustration for sweet corn growers. Sweet corn growers feel pressure from the apiculture industry without proper documentation is hampering the registration of Gaucho as a seed treatment, which is needed now that Lorsban is no longer available.

TENDER FRUIT

- **Loss of streptomycin for fire blight control**
    - Streptomycin is the only material registered for control of fire blight in producing orchards. Registration has been on an annual basis for years because of the issue concerning its use in plant agriculture resulting in antibiotic resistance in human pathogens. PMRA has requested a data package with studies and questions that amounts to the equivalent of a complete submission package. The Canadian distributor (United Agri-Prodcuts) has requested this information from the US manufacturer/originator, but they do not have the required studies completed, and the Canadian market is too small to warrant the generation of the data for PMRA. The current review is likely to result in loss of registration by the end of 2003, putting an additional constraint on pear growers. Currently, the fire blight susceptible pear cultivars Bartlett, Bosc, Anjou, Flemish Beauty and Clapp's Favorite, account for almost all commercial pear production in Ontario. Fire blight tolerant or resistant cultivars are being recommended only for trial plantings.
    - Non-antibiotic control measures are required. Development of resistant germplasm is the long-term approach to fire blight control, but cultivars currently in production are susceptible. Research is on-going in breeding for fire blight resistance using traditional breeding techniques, and in developing alternate control measures through a stimulation of plant defence mechanisms known as systemic acquired resistance (SAR).
    - Impact of the loss of fire blight control include: reduction in pear production, and removal of pear orchards; reduction in raw product available for processing at a time that the processing industry has increased needs; interdependence of peach and pear processing to maintain economic viability of processing plant.

- **Food safety: point-of-origin identification (OMAFRA Inspection Branch)**
- Four samples obtained at fruit stands had unacceptable pesticide residue levels.
- Trace-back to origin was difficult to impossible because of (i) sourcing fruit stand supplies from multiple sources; (ii) non-labelling of containers by producers.

ISSUES FROM PREVIOUS YEAR

- Plum pox virus - continue efforts for detection and eradication.
  - Recommendation for additional research activities.
  - Federal/Provincial funding in place for three years.

- Continue tree fruit breeding programs at U. of Guelph, Dept. Plant Agriculture, Vineland Station
  - staffing process expected to be completed in 2002.

- Nutrient management plan (NMP)
  - legislation expected to pass by the end of 2001
  - opportunity for input by growers and producer organizations around the proposed regulations and standards once the legislation has passed. Grower organizations can use their knowledge of current production practices regarding nutrient use to determine and communicate potential impact of proposed standards.
  - need to determine impact of the legislation on the tender fruit industry. May impact on use of manure and other organic amendments in orchards.
  - few guidelines for perennial crops - opportunities for research.

- Shrinking tender fruit land base in traditional producing regions, industry needs to expand to new areas to meet market demands
  processing peach plantings for Lake Erie north shore.

RESPONSES AND ACTION TAKEN TO THE PREVIOUS YEARS' SUBCOMMITTEE'S RECOMMENDATIONS

AGROFORESTRY

A. Recommendation #1:
Sequestering Atmospheric Carbon Dioxide and Reduction of Nitrous Oxide Emissions Through Efficient Cycling of Nitrogen and Reduced Nutrient Loading.

Work was carried out to quantify C sequestration in tree-based intercropping systems. Trees were excavated for both above and below ground biomass. Also, soil respiration has been monitored in conjunction with studies to measure c-biomass in branches and other tree components. The goal is to put the carbon budget together for this system.

Preliminary data on C sequestration suggests that tree-based intercropping systems have the potential to sequester C, 603% over that of conventional developed agricultural lands. More work is needed in this area to develop a complete C model for tree based intercropping systems.

Some progress has been made on the nitrous oxide emission issue as well. Work is continuing on "closing the N-cycle" with a focus on the N-mineralization flux in 2001. This is part of developing a complete understanding of all components so that excess N draining to streams can be quantified.

Prepared by: Naresh Thevathasan, University of Guelph

B. Recommendation #2:
Assessing the Effects of Vegetative Filtering Systems in Tree-Based Intercropping Systems against Harmful Microorganisms.

This is seen as very important work but remained unfunded as of December 2001.

Prepared by: Naresh Thevathasan, University of Guelph

C. Recommendation #3:
"Ground Truth" Station and IKONOS Satellite Image Analysis

Work continued with the generated IKONOS image in 2001 and also moved into CASI observations. Numerous images were collected and are currently being analyzed at York University.

Prepared by: Naresh Thevathasan, University of Guelph

D. Recommendation #4:
Extend the Environmental Farm Plan(EFP) Program

In the fall of 2000, there was concern that funding for the very successful EFP Program may not be extended beyond the spring of 2001. Fortunately, the program continues with funding now available until the spring of 2002.

A long-term commitment to continue funding of this important program initiative is needed.

Prepared by: Andrew Graham, OSCIA

E. Recommendation #5:
Ensure necessary technical, financial and monitoring support for Ontario's Seal of quality Program for Maple Producers

In 2001, OMAFRA provided the Ontario Maple Syrup Producers Association (OMSPA) with some assistance for technical workshops and monitoring aspects of the Seal of Quality Program.

OMSPA submitted an application to OMAFRA's Healthy Futures Program to assist with monitoring requirements of the program in 2001.

Prepared by: Dave Chapeskie, OMAFRA

F. Recommendation #6:
Extend Ice Storm Research Projects in eastern Ontario where this is needed to realize objectives.

The approved Ice storm Recovery Research Program for the maple industry will be successfully completed in accordance with the contract on December 31, 2001. There will be some effort extended in 2002 to integrate the results from the different research Projects and transfer the results to producers in a number of venues.

The Ontario Maple Syrup Producers Association (OMSPA) has prepared a Proposal to extend aspects of the Ice Storm Recovery Research and will be seeking funding in 2002. Emphasis is on areas where the initial objectives were not fully met due to time constraints. For example, it takes more than three years to fully assess the effects of fertilization and liming on the growth of ice-damaged maple trees.

Prepared by: Don Dodds, OMSPA and Dave Chapeskie, OMAFRA

G. **Recommendation #7:**
Prepare a Status Report of Commercial Nut Culture and Cultivars-H.M.S. Simcoe

A status report is now available for the Commercial Nut Culture work and cultivars at H.M.S. Simcoe.

Prepared by: Todd Leuty, OMAFRA

H. **Recommendation #8:**
Consolidate Technical Resources Related to the Establishment and Maintenance of Timberbelts, Shelterbelts and Windbreaks.

There has been no significant progress with this recommendation.

Prepared by: Dave Chapeskie, OMAFRA

I **Recommendation #9:**
Determine Need for Follow-up Research and Demonstration Related to the Sanitation and Cleaning of Tubing Systems.

A final report summarizing the results of three years of applied research related to the evaluation of alternatives to sanitize and clean maple tubing has been successfully completed and a technical report is available summarizing the results.

The Ontario Maple Syrup Producers Association has assessed the need for follow-up research in this subject area and has ranked its importance as high. Researchers at University of Guelph - Alfred campus will be developing a Proposal for follow-up in consultation with OMSPA and OMAFRA.

Prepared by: Dave Chapeskie, OMAFRA

I. **Recommendation #10:**
Investigate Steam Boiler Types Available for Use in the Production of Maple Products

A technical report related outlining considerations in the selection of steam boilers in the maple industry has been finalized and is now accessible to maple producers.

Prepared by: Dave Chapeskie, OMAFRA

Recommendation #11:
Pursue Registration of Insecticides for Use in Commercial Nut Orchards

Applications have been submitted to PMRA for national URMULE registration of DiPel2X DF for use on edible tree nuts. Nut growers in British Columbia and Ontario have no other insecticide options. Information leading to potential registration of the insecticide Neemix has been submitted to the Minor Use Coordinator for use on edible tree nuts.

Carbaryl (sevin) was rejected by PMRA for use on sweet chestnuts for the control of leaf hopper. This was unexpected since Carbaryl is registered for use on many other orchard commodities. There are no alternative insecticides for this pest problem.

Prepared by: Todd Leuty, OMAFRA

L. Recommendation #12:
Pursue Registration of Herbicides for Use in Christmas Tree Plantations

A number of herbicides mentioned in the year 2000 report were submitted to PMRA for URMULE registration. PMRA requested a two to three seasons of field trials for phytotoxicity testing on a number of tree species. These include Fraser fir, balsam fir, white pine and spruce. Trials began in 2001 and funding for complete implementation of a set of supporting trials is being pursued.

Prepared by: Todd Leuty, OMAFRA

M. Recommendation #13:
Pursue Support for Follow Up of Maple Sweet Tree Cloning Work

A technical report summarizing work completed in Ontario between 1998 and 2000 is now available.

The Maple Orchard Committee of the Ontario Maple Syrup Producers Association met to discuss the need for follow-up work. It was agreed by the Committee that additional follow-up work should proceed subject to assessing the grower facilities, obtaining an appropriate grower partner or partners for the clonal stock and securing funding.

Prepared by: Ron Hubbs, OMSPA and Dave Chapeskie, OMAFRA

N. Recommendation #14:
Maple Tapping Analysis

No progress has been made in the implementation of this project.

Prepared by: Dave Chapeskie, OMAFRA

O. Recommendation #15:
Maple Tubing Analysis-Laser and GIS

A preliminary analysis of Laser and GIS technologies for sap line layout and inventories in sugar bushes was completed in 2001 and a technical report was prepared outlining the findings. This report is available from OMAFRA.

While the technology had obvious merits, the Ontario Maple Syrup Producers Association-Research and Technology transfer Committee recommended that no further research be conducted at this time because of high projected application costs and consequently limited application in practice.

This project may be re-visited in the future.

Prepared by: Don Dodds, OMSPA and Dave Chapeskie, OMAFRA

APICULTURE

Apiculture issues.

ISSUE 1: Development of Detection Strategy and Management Protocol for the Small Hive Beetle, *Aethina tumida*

Response of OHCRSC: *Activities have already been initiated by the Provincial Apiary Specialist to monitor for this pest and evaluate detection methods being used in the U.S. This recommendation has also been forwarded to PMRA,CFIA , AAFC, Environmental Biology, U of G and the OPMRSC for further response.*

Response of Apiculture and Pollination Committee: The Provincial Apiarist conducted a training session for the Bee Inspectors in New York State. Limited surveying was carried out along the US border areas. Doug McRory and Gard Otis each wrote articles on SHB. Dr. Jeff Pettis reported on his research at the joint OBA-Michigan summer meeting. No specific research project resulted.

ISSUE 2: Development of Varroa Mite-Resistant Bee Stocks Using Different Selection Approaches and Integrating Resistance into Ontario Tracheal Mite-Resistant Existing Bee Stocks.

Response of OHCRSC*: It is the understanding of the OHCRSC that current research/tech transfer projects are addressing the issue identified in this recommendation.*

Response of Apiculture and Pollination Committee: The OBA Tech Transfer Program has been working with queen producers on selecting for HBTM resistance, Hygienic behaviour and Harbo's non-reproduction of Varroa mites trait. Gard Otis finished up the study on the French bees, which he found would not contribute to this process. Tibor Szabo's project shows that you can successful breed for reduced Varroa prevalence in honey bees.

ISSUE 3: Further Development of an Effective Integrated Pest Management (IPM) Program for Controlling Parasitic Mites and Infectious Diseases of Honey Bees.

Response of OHCRSC: *It is the understanding of the OHCRSC that current research/tech transfer projects are addressing the issue identified in this recommendation.*

Response of Apiculture and Pollination Committee: the committee members to cover this area conducted several projects.

ISSUE 4: Quality of Hive Products to Meet Consumers Expectations.

Interim Response of OHCRSC: *The OHCRSC would encourage the subcommittee to pursue opportunities to inform beekeepers about this issue. The recommendation has also been forwarded to CFIA, OMAFRA Food Industry Division, U of G Lab Services, OPMRSC and OFRSC.*

***Response of OHCRSC*:**

As part of the Horticulture Testing and Monitoring Program under the direction of Bob Forrest, Food Inspection Branch: 25 samples of honey are tested (annually) for Fluvalinate, phenols and formic acid under schedule N of the Partnership Agreement with the U of G. The testing of additional residues in honey can be explored with FIB and the Lab services. Some communications regarding testing have been with OMAFRA Apiary Specialist. Bringing on an additional test would incur additional fees for possible method development and validation in order to get the test up and running.

Response of Apiculture and Pollination Committee: The OBA tech Transfer project sent about 70 samples of beeswax and honey to Germany for testing. Results came back with none in the honey and very acceptably low levels in the beeswax.

ISSUE 5: Maintenance of the Apicultural Regulatory and Extension Programs in Ontario.

Response of OHCRSC - *(previous recommendation).*

Response of Apiculture and Pollination Committee: The Apiculture program was maintained at current levels.

ISSUE 6: Registration of CheckMite™ (Coumaphos).

Response of OHCRSC: *The OHCRSC would encourage members of the subcommittee to continue with their efforts to get these products registered for use in Canada. Referred to PMRA and the OPMRSC for additional response.*

Response of Apiculture and Pollination Committee: The Provincial Apiarist has worked with Dr. Don Wilson of Bayer. Now that Varroa have been shown to be resistant to Apistan in New Brunswick, British Columbia and a small area of Ontario around Cornwall, this registration should be able to proceed.

ISSUE 7: Federal Registration of Formic Acid Mite-Away.

Response of OHCRSC: *The OHCRSC would encourage members of the subcommittee to continue with their efforts to get these products registered for use in Canada. Referred to PMRA and the OPMRSC for additional response.*

Response of Apiculture and Pollination Committee: NOD Industries of Stirling currently have an application in with PMRA. They are awaiting a report from Dr. Medhat Nasr.

ISSUE 8: Monitoring for Varroa Resistance to Apistan®.

Response of OHCRSC: *It is the understanding of the OHCRSC that current research/tech transfer projects are addressing the issue identified in this recommendation.*

Response of Apiculture and Pollination Committee: Allison Skinner and Janet Tam of the OBA Tech-Transfer Project helped the Provincial Apiarist conduct a training session for the Bee Inspectors in the Cornwall area in August. They continued to work together through the fall on detecting the Apistan resistant Varroa mites in the area.

ISSUE 9: Development of a Marketing Strategy for Honey to Replace Imports.

Response of OHCRSC: *It is the understanding of the OHCRSC that current research/tech transfer projects are addressing the issue identified in this recommendation.*

Response of Apiculture and Pollination Committee: The Tech-Transfer project did have a booth at the Eastern Apiculture Society meeting to promote Ontario Queens as an export item. 3,000 queen bees were sold into the USA from Ontario for 2001.

B - POLLINATION ISSUES

ISSUE 1: Management Strategy for Machine Harvested Cucumbers

ISSUE 2: Pollination Requirements of New Varieties of Apples.

ISSUE 3: Produce a Best Management Practice Strategy for Pollination Management.

Response of OHCRSC: *It is the understanding of the OHCRSC that current research/tech transfer projects are addressing the issue identified in this recommendation.*

Response of Apiculture and Pollination Committee: Dr. Peter Kevan reported that he had not been able to obtain any grants for pollination in 2001.

APPLE

Recommendation 1 from the 2001 Apple Report & # 14 from the OHCRSC report

- That OMAFRA refill the position of Apple Specialist when Ken Wilson Retires in June of 2001.
- That OMAFRA provide technical Support to the Apple IPM Specialist and the Discipline specialists to assist in conducting development/research projects of significance to the industry
- That AAFC immediately hire a Population Ecologist to replace the vacancy in Vineland and refill the Plant Pathologist and Nematologist positions in Vineland when the current researchers (Dr. John Northover and Dr. John Potter) in these positions retire in 2001.

Responses in respective order:

1. After consultation with stakeholders and OMAFRA, Crop Technology refilled the Apple Specialist position immediately. The position is now located in the London Resource Center– John Finlay, Program Manager Horticulture Crops OMAFRA
2. 24 students and 4 Coop students were hired in 2001 to assist specialists and program leads in their field research and demonstration work. This hiring provides good exposure and a source of knowledge and experience to these students – John Finlay
3. The Vineland campus has 5 plant pathology positions currently. The positions will be filled on a National priority basis not on an individual station basis. – Dr. Al Tomlin AAFC

Recommendation 2 from the 2001 report

- That the Minister of Agriculture approve the implementation of the **Re-Start** proposal submitted by the Apple Growers of Ontario on behalf of the Ontario Apple Industry

Response:
The dissolution of the OAMC has cancelled the proposals at this point in time. Prior to the dissolution of the Commission there was a meeting with the Tender Fruit Board with discussions aimed at adding pears and peaches to the proposal as potential replant options.
This recommendation was largely beyond the scope of the committee and the parent organization.

Recommendation 3 from the 2001 Report

- That OMAFRA immediately approve the Healthy Futures proposal, ***Project Triad:*** tree to retailer Innovative Apple Development, Submitted by the Apple Growers of Ontario

Response:
The OAMC is gone and the project is essentially finished. The funds obtained by Bernie Solymar from the Chemical Industry were moved to Norfolk so the work could be continued. This was supposed to be a 3-year project. A report is pending on some of the work that has been done regarding the pest management component.

BERRY CROPS

RECOMMENDATION # 1

Issue: Nutrient Management in Berry Crops

Target Agency: Resources Management Branch, ARD, and Research and Corporate Services Division of OMAFRA

Recommendation: That nutrient management in berry crops be made a high priority in the competitive grant system currently available and in future grant programs.

Response:
Nutrient management and water quality have been identified as priority areas eligible for funding under the Environment section of the New Directions in Agri-Food and Rural Research Program. The New Directions program is the primary competitive research fund administered by the Research and Corporate Services Division of OMAFRA. Approximately $1.2 million dollars will be allocated to new projects in 5 priority areas in 2001-2002. Details including the New Directions Call for Proposals can be found on the OMAFRA website at http://www.gov.on.ca/OMAFRA/english/research/new_directions/index.html.

Action:
A nutrition study for strawberries has been initiated by the Department of Plant Agriculture, Vineland, University of Guelph.

RECOMMENDATION # 2

Issue: Adoption of DNA-based PCR Diagnostics for Plant Diseases

Target Agencies: Agriculture and Rural Division (ARD), OMAFRA,; Lab Services Division (LSD), University of Guelph; Ontario Horticultural Crops Research and Services Committee (OHCRSC); and the Ontario Fruit and Vegetable Growers Association (OFVGA).

Recommendation: That all stakeholders work together to develop a plan to bring this research to fruition, specifically:
1) that ARD, OMAFRA evaluates the potential for the application of this technology and takes the lead role in bringing the stakeholders together;
2) that OHCRSC make its sub-committees aware of this diagnostic technique and its potential; and
3) that LSD poll the sub-committees for their level of interest and support in order to develop a business case.

Response:
None to date.

RECOMMENDATION # 3

Issue: Continuity of Nematology Research

Target Agency: Southern Crop Protection and Food Research Centre (SCPFRC), Agriculture and Agr-Food Canada (AAFC), Vineland

Recommendation: We recommend that AAFC open a new position in nematology, initially on a term basis if necessary, to attract a well-trained scientist and provide continuity in the nematology program.

Objective:
To provide continuity of the nematology program at AAFC Vineland.

Response:
As you have alluded to in your background to this recommendation, your committee has previously raised the issue of replacing the nematologist, located at our Vineland facility, when he retires. In fact, our nematologist at Vineland is now planning to retire in January, 2002.

As you may be aware, our Research Branch is currently undergoing a broad re-evaluation and re-organization of its research programs, each to be headed by a National Program Leader starting in the next fiscal year. The expectation is that staffing of professional positions within the Research Branch will reside with each of these Program Leaders, and not with each research centre as it does currently.

However, a replacement for the nematologist research position at SCPFRC is being actively considered by SCPFRC Team Leaders within the context of the broader needs for this discipline throughout southern Ontario.

Action:
Given the information above and the importance of the nematology program at Vineland to the industry, this committee will re-submit this recommendation in 2001.

RECOMMENDATION # 4

Issue: Virology Research in Berry Crops

Target Agency: Southern Crop Protection and Food Research Centre (SCPFRC), Agriculture and Agr-Food Canada (AAFC), Vineland

Recommendation: That AAFC Vineland initiate a research program in the virology of berry crops.

Response:
SCPFRC currently does not have a mandate for berry crop research. This mandate currently resides with our sister research centre (AFHRC) in Kentville, NS. We recommend you approach Dr Wade Johnston, Director, AFHRC to arrange appropriate collaborative efforts to meet your specific research needs.

As you mention in your background, Dr. Lorne Stobbs, at our Vineland facility, has expertise in this area. On an as-required basis he would be prepared to collaborate with AFHRC on berry crop research issues.

Action:
This committee has requested that the project leader of berry crop research from the Atlantic Food and Horticulture Research Centre (AFHRC) become a member of the committee.

CRUCIFER CROPS

Both AAFC, London and University of Guelph, Ridgetown acknowledged the need for research for cabbage maggot on rutabagas, however very few resources are available to initiate such work and very little was done in 2001.

OMAFRA responded to the issue of funding for nutrient management plans by stating that the current funding does take into account this priority but that no new funds have been allotted to this issue specifically.

AAFC, Policy Branch did not reply in writing to the recommendation **note – see AAFC response provided to OHCRSC chair on page 153*** about the cut to 50% minor use funding, however they did reinstate the 75% funding for URMULE projects in 2001.

For many years, PMRA has not responded to OASCC recommendations, however in recent months, many initiatives at the grower industry level, provincial level and the political level have been taken to address the major issues facing the minor use program. Changes are desperately needed if there is to be any progress on this very important issue.

GRAPE & WINE

Issue 1: Control of Powdery Mildew on Grapes

No response

Issue 2: Research Vacancies at Agriculture Canada, Vineland Station

Response:

As you have alluded to in your background to this recommendation, our nematologist at Vineland is now planning to retire in January, 2002.

As you have alluded to in your background to this recommendation, our nematologist at Vineland is now planning to retire in January, 2002.

As you may be aware, our Research Branch is currently undergoing a broad re-evaluation and re-organization of its research programs, each to be headed by a National Program Leader starting in the next fiscal year. The expectation is that staffing of professional positions within the Research Branch will reside with each of these Program Leaders, and not with each research centre as it does currently.

However, a replacement for the nematologist research position at SCPFRC is being actively considered by SCPFRC Team Leaders within the context of the broader needs for this discipline throughout southern Ontario.

Research Centres are working with HQ-Ottawa on staffing through graduate mentoring programs for new researchers (a small pilot was run this year). The issue of research capacity is at the top of the agenda for the 5 science-based federal departments (NRCan, AgCan, HealthCan, EnvCan, Fisheries & Oceans), and we have had several meetings with those departments and representatives of the core funding agencies as to how to address the problem and plan for the future. As has been discussed, it is becoming increasingly difficult to find young researchers trained in traditional plant protection disciplines (eg. nematology, entomology, plant pathology) because North American & European universities are training so few now.

Issue 3: Good Laboratory Practices (GLP) Requirements for User Requested Minor Use Label Expansion Program *(URMULE) – Lack of Resources, Increased Costs and Funding Difficulties

Response:
OHCRSC Response:
The OHCRSC supports recommendations made by the OPMRSC related to GLP funding and certification. The OHCRSC would encourage the collaboration of OMAFRA, University of Guelph and AAFC to make sure access to GLP compliant Research field sites are available at research facilities across Ontario The recommendation has also been forwarded to AAFC Policy Branch for further response.

Please note: In follow up by the chair after the OHCRSC we have received information indicating that the following facilities are GLP compliant or are in progress of pursuing some level of GLP compliance:
University of Guelph, Simcoe campus
University of Guelph, Kettleby
AAFC Harrow (in progress)
Lab Services, University of Guelph

AAFC Response:
It was proposed that the cost sharing arrangements for the program would decline this fiscal year from a maximum of 75 % to 50 % to reflect the general target of 50 % for most CARD funding initiatives. However, given the substantial additional costs to achieve the new Good Laboratory Practices (GLP) requirements for data development work, the existing 75:25 maximum cost-sharing arrangement remain in effect to ease the financial burden on those producer groups who sponsor and contribute to research projects, particularly those which develop residue data.

For fiscal year 2001-02, agreements have been concluded with the Canadian Horticultural council (CHC) for eight joint Canada-U.S. IR-4 related minor use label expansion projects with AAFC funding up to $233,000 and ranging from 43 to 50 % of the total eligible costs of each project. The CHC is coordinating all of these projects.

In addition, twelve URMULE (minor use label expansions) projects, mainly with horticultural organizations, have been approved this year with AAFC funding of $110,000 and ranging from 45 to 75 % of the total eligible cost of each project.

The amount of support for a project is based on an individual project assessment and recommendations on project priorities and cost effectiveness from an advisory group composed of AAFC staff and industry representatives, including representation from the CHC.

Issue 4a: Impact of Pesticide Re-evaluation Regulations
USDA-EPA Food Quality Protection Act (FQPA)

PMRA Organophosphate Re-evaluation

OMAFRA Response: OMAFRA staff continue to support efforts with minor use registration and development of IPM and resistant management strategies.
The OMAFRA Minor Use Coordinator utilizes the Minor Use priorities developed by the OHCRSC subcommittees to develop priorities for minor use submissions. The Minor Use Coordinator also participates in meetings with IR-4 Program in the U.S. to assist in identify products that have potential for registration in Ontario.

In response to recommendations forwarded to CARC (Canadian Agri-Food Research Council) a Minor Use Workshop for invited representatives from federal, provincial govt, industry and grower organizations will be held on Dec 6 and 7th, 2001 to discuss Minor Use Registration Issues and Solutions.

Issue 4b Availability of Pesticides and Grape Integrated Pest Management Program
Response: see response to 4a

Issue 5: Cash Restrictions to support Research Projects

Response: Research funding guidelines are established by the funding agencies sponsoring the research

Issue 6: Lack of Awareness /Coordination of Research Supporting Grape Industry

Response: The OHCRSC appreciates the efforts of the chair and the committee and agencies identified to work collectively to increase the coordination and awareness of research supporting the industry. Progress has been made in this area by encouraging more direct articles by all researchers and consultants in OMAFRA's Grape and Tender Fruit Vine Newsletter. In addition, Brock University continues to have one day and evening information sessions for grape producers.

Issue 7: Cost of Production Studies for Grapes

Response: The Cost of Production publication is currently being revised and will be printed in 2001-2002 fiscal year.

Issue 8: Snail Problem

Response: this is an identification of a void in research capacity. The OHCRSC would recommend that the subcommittee try to address specific pest problems through expertise of its subcommittee members or by contacting research personnel to make them aware of this research priority. PMRA has registered a commercial metaldehyde bate for the control of snails in grapes.

Issue 9: Time-line for Strategic Plan and Subcommittees

Response:
The Chair of OHCRSC in conjunction with staff from Innovation and Risk Management Branch organized a training session for chairs of the OHCRSC in April, 2001 that outlined the guidelines, procedures and requirements for the 2001 Strategic Planning process.

After discussion with the subcommittee chairs, the meeting schedule has remained similar to past years.

The OHCRSC chair and IRMB staff will work with U of G Plants Program Director to provide research priorities and recommendations so that they are available to research personnel to develop proposal for the Plant Program research proposals.

GREENHOUSE AND PROTECTED CROPS

The members of the Ontario Greenhouse & Protected Crops Research and Services Subcommittee of the OHCRSC are grateful to the Department of Plant Agriculture, University of Guelph, for filling the faculty position on greenhouse vegetables at the Vineland Station Campus

It is recommended that:

The status quo of: "10% teaching, 90% research and extension" for the faculty position on greenhouse vegetables, in Vineland, be maintained.

Response: The OHCRSC would suggest that the subcommittee or appropriate industry organization contact Dr. Clarence Swanton directly to confirm the time allocation assigned to this faculty position for teaching, research and extension. This recommendation has also been referred to Dr. Swanton.

NURSERY/LANDSCAPE & TURFGRASS

The Nursery, Landscape and Turf subcommittee acknowledges the support of the OHCRSC parent committee with respect to last year's recommendations.

Responses to last year's recommendations were discussed at the fall meeting.

Research programs continued to address industry needs as evidenced by the continuation of projects and the initiation of new research efforts designed to meet stated concerns. The support of service personnel in extension and lab areas is also appreciated and continues to meet industry expectations.

POTATOES

The following was the 2000 recommendation identified by the committee:

In light of the effects of the US FQPA and the current lack of true pesticide registration harmonization, the Canadian and the US registration systems need to more rapidly become North American in standards for crop protection.

The target agencies were PMRA and AAFC, Policy Branch

The committee did not receive any response to this recommendation

ROOT, BULB AND LEAFY VEGETABLES

In 2000, five recommendations were forwarded to our parent committee, OHCRSC. A summary of the recommendations and actions taken since the 2000 Annual Meeting is summarized below:

1. **Request for dedicated funding for Nutrient Management Planning research (directed to OMAFRA and AAFC-Policy Branch).**

   Response from OMAFRA, received November 9, 2001: OMAFRA funding for research on horticultural crops is mainly directed through the OMAFRA-University of Guelph agreement and through Ministry competitive funds.

   The Plants Program under the OMAFRA-University of Guelph agreement is in the last year of a four year program. In 2002, a new program of plant related research will be initiated. It is unlikely that the Ministry research budget will increase in 2002. Therefore, the need to clearly determine priorities has never been more important to ensure that funds are distributed across priority areas in the most effective manner. The priorities identified by OHCRSC in 2001 will be an important tool in determining the amount of research that is focused on nutrient management research.

   The New Directions for Agri-Food and Rural Research Program is an open, competitive research fund managed by OMAFRA. The 2002 Call for Proposals invites research in 5 priority areas including "Healthy Environment". Nutrient management is one of the topics included under the Healthy Environment section.

   OASCC concerns in 2000 regarding the need for nutrient management research were communicated in the OMAFRA report to the Canadian Agri-Food Research Council (CARC) and as a result, Nutrient Management is included in the National Priorities for 2001-2002.

2.Harm onization of Registered Pesticide Products and increased support for costs of GLP-compliant residue trials (directed to AAFC-Policy Branch and PMRA, Health Canada).

Responses from OMAFRA, received September 11, and November 16, 2001: OMAFRA continues to work to work very hard in this area. Jim Chaput, Minor Use Coordinator actively participates in all IR-4 workshops and coordinates combined Canadian/ U.S. research work for data development. OMAFRA conducted a two day tour for 12 evaluators from PMRA this past summer. They were taken to many sights to witness minor crop production eg. chinese vegetables, cucumbers, green onions, strawberries etc. and finally OMAFRA worked with B.C. and Quebec to orchestrate a meeting between the three provincial Assistant Deputy Ministers and Clare Franklin and Wendy Sexsmith of the PMRA.

As a result of some of the recommendations put forward by OASCC to CARC (Canadian Agricultural Research Committee), CARC has organized a Minor Use Workshop for representatives from federal and provincial govt, industry and producer groups on Dec 6th to talk about minor use registration issues.

Responses from AAFC-Policy Branch, received November 16, 2001: It was proposed that the cost sharing arrangements for the program would decline this fiscal year from a maximum of 75 % to 50 % to reflect the general target of 50 % for most CARD funding initiatives. However, given the substantial additional costs to achieve the new Good Laboratory Practices (GLP) requirements for data development work, the existing 75:25 maximum cost-sharing arrangement remain in effect to ease the financial burden on those producer groups who sponsor and contribute to research projects, particularly those which develop residue data.

For fiscal year 2001-02, agreements have been concluded with the Canadian Horticultural council (CHC) for eight joint Canada-U.S. IR-4 related minor use label expansion projects with AAFC funding up to $233,000 and ranging from 43 to 50 % of the total eligible costs of each project. The CHC is coordinating all of these projects.

In addition, twelve URMULE (minor use label expansions) projects, mainly with horticultural organizations, have been approved this year with AAFC funding of $110,000 and ranging from 45 to 75 % of the total eligible cost of each project.

The amount of support for a project is based on an individual project assessment and recommendations on project priorities and cost effectiveness from an advisory group composed of AAFC staff and industry representatives, including representation from the CHC.

3. Cooperation between OMAFRA and AIMS in establishing and supporting complete crop scouting services for growers (directed to OMAFRA and AIMS).

No formal response was received to this recommendation, however representatives of AIMS and OMAFRA indicated that there has been cooperation in the provision of training by OMAFRA for crop scouts and that the possibility of greater field-based training programs is being jointly explored.

4.GLP-certification of facilities and personnel at University of Guelph Laboratory Services Division and Research Stations, and at AAFC (London and St-Jean-sur-Richelieu) (directed to University of Guelph and AAFC).

No formal response was received to this recommendation, however, representatives of several organizations indicated that personnel and facilities at UofG Muck Crops and Simcoe Research Stations received GLP-certification in 2001 and that LSD is apparently pursuing GLP-certification. No action has been taken by AAFC research centres to obtain GLP-certification. The Muck Crops Research Station is the only available GLP-compliant centre available for insecticide and fungicide trials. GLP-certified personnel at Simcoe focus on herbicides. There is the possibility of GLP-certification of personnel and/or facilities for herbicide research at UofG Ridgetown College.

5.Availability of PCR Diagnosis for Aster Yellows at UofG Pest Diagnostic Clinic (directed to U of G Laboratory Services Division).

No formal response was received to this recommendation, however an informal meeting was held between OMAFRA, ARD (John Finlay and Kristen Callow); OMAFRA, Risk Management (Arlene Robertson); and U of G Lab Services (John Melichercik and Patricia Collins) to discuss the possibility of supplying PCR diagnostic services to growers. LSD has requested further information concerning the number of growers and consultants that might use this service, expected number and flow of samples, costs and response-time that would be acceptable to growers, etc. LSD is looking for the generation of profits from this type of service rather than cost-recovery.

It was decided by this committee, that further investigation and consideration of this issue is warranted (including determination of how labs in the US are able to provide this service for free or at low cost to growers). Growers may want to consider making arrangements for sample testing with labs in the US that provide free services to US growers.

SWEET CORN

Recommendation 1 from 2000

"*Increase the funding available to the minor use registration process in order to allow more pest control products to move through the system*"

Response:

Response from Bill Boddis, AAFC, re URMULE and URMUR funding:
It was proposed that the cost sharing arrangements for the program would decline this fiscal year from a maximum of 75 % to 50 % to reflect the general target of 50 % for most CARD funding initiatives. However, given the substantial additional

costs to achieve the new Good Laboratory Practices (GLP) requirements for data development work, the existing 75:25 maximum cost-sharing arrangement remain in effect to ease the financial burden on those producer groups who sponsor and contribute to research projects, particularly those which develop residue data.

For fiscal year 2001-02, agreements have been concluded with the Canadian Horticultural Council (CHC) for eight joint Canada-U.S. IR-4 related minor use label expansion projects with AAFC funding up to $233,000 and ranging from 43 to 50 % of the total eligible costs of each project. The CHC is coordinating all of these projects.

In addition, twelve URMULE (minor use label expansions) projects, mainly with horticultural organizations, have been approved this year with AAFC funding of $110,000 and ranging from 45 to 75 % of the total eligible cost of each project.

The amount of support for a project is based on an individual project assessment and recommendations on project priorities and cost effectiveness from an advisory group composed of AAFC staff and industry representatives, including representation from the CHC.

Recommendation 2 from 2000

"Encourage the PMRA and OMAFRA to continue to work with the EPA and IR4 in order to reduce the inconsistencies in availability of pesticides between Ontario and US producers"

Response: OMAFRA continues to work to work very hard in this area. Jim Chaput, Minor Use Coordinator actively participates in all IR-4 workshops and coordinates combined Canadian/ U.S. research work for data development. OMAFRA conducted a two day tour for 12 evaluators from PMRA this past summer. They were taken to many sights to witness minor crop production eg. chinese vegetables, cucumbers, green onions, strawberries etc. and finally OMAFRA worked with B.C. and Quebec to orchestrate a meeting between the three provincial Assistant Deputy Ministers and Clare Franklin and Wendy Sexsmith of the PMRA.

Recommendation 3 from 2000

"Funding be made available/redirected in order to address research concerns stemming from the upcoming nutrient management planning legislation and regulations"

Response:

OMAFRA funding for research on horticultural crops is mainly directed through the OMAFRA-University of Guelph agreement and through Ministry competitive funds.

The Plants Program under the OMAFRA-University of Guelph agreement is in the last year of a four year program. In 2002, a new program of plant related research will be initiated. It is unlikely that the Ministry research budget will increase in 2002. Therefore, the need to clearly determine priorities has never been more important to ensure that funds are distributed across priority areas in the most effective manner. The priorities identified by OHCRSC in 2001 will be an important tool in determining the amount of research that is focused on nutrient management research.

The New Directions for Agri-Food and Rural Research Program is an open, competitive research fund managed by OMAFRA. The 2002 Call for Proposals invites research in 5 priority areas including Healthy Environment. Nutrient management is one of the topics included under the Healthy Environment section. Approximately $1.2 million dollars will be allocated to new projects in 5 priority areas in 2001-2002. Details including the New Directions Call for Proposals can be found on the OMAFRA website at http://www.gov.on.ca/OMAFRA/english/research/new_directions/index.html

OASCC concerns in 2000 regarding the need for nutrient management research were communicated in the OMAFRA report to the Canadian Agri-Food Research Council (CARC) and as a result, Nutrient Management is included in the National Priorities for 2001-2002.

TENDER FRUIT

2000-1 The TFRSSC recommends a coordinated effort to eradicate plum pox virus in stone fruits in Ontario (OHCRSC 61).

Federal and Provincial Government funding (~$40m over 3 years) allocated for eradication and research. CFIA and AgriCorp conducted additional surveys in 2001, more infected trees eliminated. Task Force meetings held in November in conjunction with an International Workshop on Plum Pox Virus.

Follow-up: A new recommendation regarding plum pox research is to be developed and submitted.

2000-2 The TFRSSC recommends that the University of Guelph, Department of Plant Agriculture, staff the stone fruit breeding position and the tender fruit orchard management position at Vineland Station (OHCRSC 62).

Following a second round of interviews for the breeding position, the Selection Committee has made a recommendation to the Chair, Department of Plant Agriculture, offer currently in University approval process. Orchard management position to be filled internally, with J. Cline having Vineland involvement in stone fruits and D. Hunter for pear management.

Follow-up: resubmit recommendation to ensure the staffing process is completed in 2002.

2000-3 The TFRSSC recommends that OMAFRA Policy Branch assist the TFRSSC, OTFPMB in an interim survey of trends on tree fruit plantings (OHCRSC 63).

From D. Hope, OMAFRA: A survey was last done in 1999, so the next survey is scheduled for 2004. If the industry wants to do some extra work between surveys and is willing to take on and resource the project themselves, OMAFRA could provide some technical help but is unable to conduct an additional survey. A caution is that producer participation often decreases when frequency of surveys goes up.

Follow-up: A. Huisman and K. Slingerland will discuss this with D. Hope. The additional survey is being requested because of requests by some growers to keep their 1999 Tree Survey forms confidential and kept within OMAFRA Policy Branch.

2000-4 Review by PMRA, FQPA Impact and Identification of High Priority Pest Control Products and Potential Alternatives (OHCRSC 64).

No direct response from PMRA, but the following information on 2001 activities was provided by A. Anderson: OMAFRA arranged for PMRA staff to visits grower operations for a number of horticultural crops to help increase understanding of pest problems and issues that face growers (such as FQPA implications). A meeting held in Quebec City with OMAFRA, B.C., Quebec and PMRA officials to discuss pesticide registration issues. CARC has organized a minor use workshop for invited representatives of federal and provincial governments, industry and producer groups to discuss issues and solution to minor use registration issues. The exercise undertaken by TFRSSC to identify minor use priorities should help in identifying alternative control products.

Follow-up: remains a priority but remove from recommendation list - include in a revised recommendation pertaining to chemical issue.

2000-5 The TFRSSC recommends that OMAFRA provide support and resources for the TFRSSC to update the OMAFRA Publication 430, Fruit Cultivars and provide support for posting the revised version on the OMAFRA web page (OHCRSC 65).

K. Slingerland reported help of U. of Guelph, AAFC, OTFPMB and nurseries in completing a draft of Tender Fruit revisions. Publication will be in binder form to facilitate revision, also posted on the OMAFRA web site

2000-6 The TFRSSC recommends that OMAFRA commit resources to the development of guidelines for nutrient management plans for tree fruit research (OHCRSC 66).

From response from D. Speranzini: OMAFRA has contributed significant resources into development of standards and guidelines for NMP. Research monies available through Healthy Futures and New Directions programs. Bill 81 passed first reading in June, 2001, second and third readings expected later this year. There will be plenty of opportunity for input by growers and producer organizations around the proposed regulations and standards once the legislation has passed. Grower organizations can use their knowledge of current production practices regarding nutrient use to determine and communicate potential impact of proposed standards.

2000-7 The TFRSSC recommends that CFIA, OTFPMB, nursery operators, OFTA develop a plan for the introduction of a nursery certification program for tender fruit (OHCRSC 67).

OTFPMB partnered with UofG, OMAFRA, CFIA, AAFC, OFTA and Nabisco Limited and developed plan for a Prunus Certification program that will address the industry's short and long-term needs relative to an ample supply of virus tested nursery stock. The plan has been submitted for approvals from CFIA and OMAFRA

2000-8 The TFRSSC recommends that AAFC-Vineland continue to provide crop protection research and support to the tender fruit industry by the timely staffing of positions in entomology, pathology and nematology (OHCRSC 68).

Both the Entomology and Pathology positions have been advertised, but two rounds of interviews for Entomology and one for Pathology failed to identify suitable candidates. Nematology position will be open when J. Potter retires in early 2002.

Follow-up: resubmit recommendation, tie in with TFRSSC research priorities.

TOMATOES

Recommendation 1 - Aging demographics of scientific community.
In order to maintain program integrity, a succession plan for scientific expertise and for research support must be developed. The sub-committee views the aging demographics of staff as a future barrier to program delivery. With the influx of term and casual employees under externally funded projects, the recruitment and maintenance of core expertise to propose and direct appropriate research initiatives is essential. Furthermore, we recommend that the weed science position at Ridgetown College be filled as soon as possible. This recommendation should be directed to AAFC and Univ. of Guelph.

Response
This recommendation was referred by the OHCRSC to Dr. Gary Whitfield, AAFC, Harrow and
Dr. Gary Ablett, Ridgetown College.

The following was received from Dr. Gary Ablett, Ridgetown College:
This recommendation primarily speaks to management of human resources on an institutional level. Within the constraints of budget, we have faculty replacement plans which are implemented as funds become available. In terms of the weed scientist position, that has been filled, effective July 2001. The new staff member is Dr. Darren Robinson who comes to us from the Alberta Research Council.

The following was received from Dr. Gary Whitfield, AAFC, Harrow:
All requirements for filling professional positions in AAFC are carefully reviewed by the Research Branch Executive Committee of AAFC which is chaired by the Assistant Deputy Minister. A business case is prepared by the Centre Director, which includes an explanation of needs and benefits for Canadians in supporting such a request.

Recommendation 2 - Nutrient Management Plan.
Given the high potential impact that nutrient management planning legislation may have on the tomato industry, this committee recommends that public funding programs aimed at promoting nutrient management research be developed. This recommendation should be directed to OMAFRA and AAFC.

Response
The OHCRSC acknowledges that the need for research in nutrient management for all horticultural crops is a high priority and will recommend to OASCC to make research funding for nutrient management research and technology transfer a high priority.

Response from OMAFRA:
OMAFRA funding for research on horticultural crops is mainly directed through the OMAFRA-University of Guelph agreement and through Ministry competitive funds.

The Plants Program under the OMAFRA-University of Guelph agreement is in the last year of a four year program. In 2002, a new program of plant related research will be initiated. It is unlikely that the Ministry research budget will increase in 2002. Therefore, the need to clearly determine priorities has never been more important to ensure that funds are distributed across priority areas in the most effective manner. The priorities identified by OHCRSC in 2001 will be an important tool in determining the amount of research that is focused on nutrient management research.

The New Directions for Agri-Food and Rural Research Program is an open, competitive research fund managed by OMAFRA. The 2002 Call for Proposals invites research in 5 priority areas including Healthy Environment. Nutrient management is one of the topics included under the Healthy Environment section. Approximately $1.2 million dollars will be allocated to new projects in 5 priority areas in 2001-2002. Details including the New Directions Call for Proposals can be found on the OMAFRA website at http://www.gov.on.ca/OMAFRA/english/research/new_directions/index.html

OASCC concerns in 2000 regarding the need for nutrient management research were communicated in the OMAFRA report to the Canadian Agri-Food Research Council (CARC) and as a result, Nutrient Management is included in the National Priorities for 2001-2002.

Recommendation 3 - Access to crop protection materials.

The industry continues to have difficulties with situations where pesticides are registered in the U.S. but not registered in Canada. Canadian growers are often denied (or delayed) access to newer, safer and biocontrol materials. Imported produce from the US is often treated with the products denied to Canadian farmers. The implementation of the Food Quality Protection Act in the US will mean that some of the older materials will no longer be available or that produce treated with these products cannot be exported to the US.
Actions required include:
- speeding up the registration process.
- harmonization of pesticide registration in the U.S. and Canada.
- providing adequate funding for the URMULE and URMUR programs.

Direct to PMRA & Policy Branch,OMAFRA

Response

This recommendation was forwarded by OHCRSC to OPMRSC and to PMRA and to Policy Branch of OMAFRA for response.

Response from Bill Boddis, AAFC, re URMULE and URMUR funding:

It was proposed that the cost sharing arrangements for the program would decline this fiscal year from a maximum of 75 % to 50 % to reflect the general target of 50 % for most CARD funding initiatives. However, given the substantial additional costs to achieve the new Good Laboratory Practices (GLP) requirements for data development work, the existing 75:25 maximum cost-sharing arrangement remain in effect to ease the financial burden on those producer groups who sponsor and contribute to research projects, particularly those which develop residue data.

For fiscal year 2001-02, agreements have been concluded with the Canadian Horticultural Council (CHC) for eight joint Canada-U.S. IR-4 related minor use label expansion projects with AAFC funding up to $233,000 and ranging from 43 to 50 % of the total eligible costs of each project. The CHC is coordinating all of these projects.

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The amount of support for a project is based on an individual project assessment and recommendations on project priorities and cost effectiveness from an advisory group composed of AAFC staff and industry representatives, including representation from the CHC.

Other activities:

OMAFRA staff arranged tours for PMRA staff to visits grower operations for a number of horticultural crops in 2001. This helps increase the understanding of pest problems that face growers.

OMAFRA organized a meeting held in Quebec City with provincial counterparts from B.C. and Quebec and PMRA officials to discuss pesticide registration issues.

As a result of priorities that have been forwarded through the Research and Service Committees to CARC, CARC has organized a minor use workshop for invited representatives of federal and provincial governments, industry and producer groups to discuss issues and solution to minor use registration issues.

The following was printed in the OPVG Newsletter No. 9, Oct. 19, 2001:
While some progress towards harmonizing the Canadian and U.S. pesticide registration systems has been achieved, this progress has come slowly and much more needs to be done. Since the U.S. Food Quality Protection Act was put in place, the 'technology gap' between what products Canadian farmers have access to for pest control and what their U.S. counterparts have, is widening rapidly. Why? Because the U.S. EPA has committed to deregister older, potentially more hazardous products only if a suitable alternative pest control product or practice is available. Here in Canada, the PMRA follows the U.S. lead in deregistering products, but has made no similar commitment to ensure a suitable alternative is available for Canadian producers. Since many of these deregistrations occur on products for horticultural and small acreage crops, there is little incentive for companies to expend the effort and cost of seeking a registration for a Canadian minor use.

The PMRA seems to have little understanding of business realities faced by either growers (who need equitable access to tools available to our competitors just across the border), or pesticide companies (who must expect a profitable market if they are to pursue registration of a pest control product). Obviously food safety or environmental hazard is not the issue, as U.S. food
products produced with these newer, more target-specific and safer products share (and compete for) shelf space in Canadian grocery stores. The issue with PMRA appears to be, unfortunately, more about workload management and job security, than it is about protecting health, safety and the environment for Canadians.

Indeed, many companies are already not utilizing the current option open to them for joint PMRA/EPA review of a new product, for fear that the joint process will delay their U.S. registration, and thus delay access to the huge U.S. marketplace.

The OPVG, along with other Ontario commodity organizations, the Ontario Food Processors Association, and OMAFRA are all working to try to find a solution to this dilemma - a solution that is a win/win/win for all involved - equitable access to newer, safer crop protection technologies; an abundance of high quality, affordable food produced domestically using environmentally responsible practices; efficient, responsive and accountable government and regulatory operations; and a suitable business climate for companies and technology developers.
If Ontario is to continue to be a competitive, long term source of supply for processing vegetables, it is absolutely essential that the pesticide regulatory structure in Canada mirror the efficiency and attitude of that of our major trading partner.

STRATEGIC DIRECTIONS/PROBLEMS OR ISSUES/SECTOR PRIORITIES

AGROFORESTRY

Part 1 . Research needs

Priority grouping "A"

Issue #1: **Importance of Agroforestry Research at the University of Guelph in Helping Meet Environmental Management Objectives.**

Description:

In the last several decades there has been a plethora of unequivocal evidence indicating that the global climate is changing. As a counter measure, climate change mitigation and adaptation processes are being examined globally. In Canada, both federal and provincial governments are working towards meeting Kyoto standards by the year 2012. In this context, agroforestry based land-use systems are being considered as having significant potential to augment carbon (C) sequestration and to reduce greenhouse gas (GHG) emissions in agroecosystems. However, there is no research to date in Canada in general, and in Ontario in particular that will contribute to the above knowledge. Therefore, all agroforestry based land-use systems in Ontario need documenting with respect to their current and future contribution towards climate change mitigation processes in particular and to the environment (emphasis on nutrient management and water quality) in general. The possible expansion of these land-use practices on marginal and degraded land needs to be evaluated and the overall impact on meeting Kyoto standards by 2012 needs to be quantified and verified. The information derived from this research will also be helpful in formulating appropriate policy to facilitate large-scale adoption in the province. The proposed research will also identify methodologies that could be used to calculate C credits and trading in the future, an area that is being widely discussed and scrutinized by many industries and sectors around the world. Agroforestry-based land use systems have large potential in this regard and, therefore, results from this strategic approach will be useful in the design and development of such systems for many areas of Canada on a national level.

Background:

Recommended land-use changes in agriculture, such as zero tillage and minimum tillage, believed to sequester more C in soil, have proven otherwise (Angers et al., 1995; Voroney and Angers, 1995). Furthermore, in the forest sector, an increase in the occurrence of forest fires since 1979, possibly linked to climate change, makes it difficult to determine if Canada's forests will remain a sink for C or become a long-term source. The above factors in conjunction with the burning of fossil fuel and intensive agriculture have contributed to a 10 % increase in Canadian CO_2 emissions, from 454,226 Gg in 1991 to 499,526 Gg in 1995. Therefore, alternative land management strategies and farming system technologies that may increase the ability of agricultural lands to trap atmospheric C need to be developed in Canada, in order to meet the terms of reference of the Kyoto Protocol. This will also aid in understanding the extent to which these alternative land-use practices may contribute to the provision of a global buffer to increased atmospheric CO_2.

Agroforestry is a collective term used to describe land-use practices that incorporate trees into farming systems. Agroforestry has its roots in the developing world, where lack of land resources in the presence of high population growth necessitated the development of novel and simultaneous wood and food production systems by indigenous peoples. In North America, many different types of agroforestry have been employed historically (Gordon et al., 1997), but the vast potential economic and environmental benefits attributed to agroforestry have yet to be realized on a large scale.

In the recent past, many studies have identified tree-based land-use practices (agroforestry) as a significant global opportunity to reduce the accumulation of CO_2 in the atmosphere (Schroeder, 1993; Unruh et al., 1993; Nair, 1993; Dixon, 1995; Young, 1997). The United Nations has also estimated that agroforestry based land-use practices on marginal or degraded lands could sequester 0.82-2.2 Pg C per year, globally, over a 50-year time frame (Dixon et al., 1994). Agroforestry land-use practices are less adopted in Canada even though there is a great potential for their adoption. Estimates of marginal or degraded land technically suitable for establishment of agroforestry systems in North America are between 90 - 140 x 10^6 ha, and in Canada, 57 x 10^6 ha (agricultural land classes 3 through 6).

The main types of agroforestry systems currently being researched in many areas of North America and applicable to portions of the Canadian landscape would include windbreaks and shelterbelt systems (e.g. Loeffler et al., 1992), silvipastoral systems [animals / pasture and trees] (Bezkorowajnyj et al., 1993), integrated riparian forest systems (O'Neill and Gordon, 1994; Oelbermann and Gordon, 1999), forest farming systems (Williams et al., 1997) and intercropping systems [crops are grown between widely spaced tree rows] (Gordon and Williams, 1991; Williams and Gordon, 1992, 1994, 1995; Ntayombya and Gordon, 1995; Thevathasan and Gordon, 1995, 1997; Thevathasan et al., 1999). Carbon sequestration potential and GHG emissions reduction potential of these systems needs to be quantified and verified in a planned strategic manner.

Recommendation(s):

a) A GPS / GIS database should be developed for all current agroforestry based land-use activities in Ontario. In addition to the above, potentially available land area that could be brought under some form of temperate agroforestry systems in the future also should be documented. Development of such a database will facilitate accurate quantification of C sequestration through agroforestry based land-use systems and contribute to climate change mitigation impact assessment studies in the future.

b) Immediate research is needed to quantify C sequestration and to model C dynamics in province-wide agroforestry-related land-use practices (e.g. tree-cereal intercropping, orchard tree-based intercropping, windbreaks, riparian buffer strips, silvopasture, forest farming etc.)

c) Agroforestry-related land-use practices also have the potential to reduce nutrient loading to adjacent waterways through the development of efficient nutrient cycling systems. The above mechanism could significantly reduce nitrous oxide emissions through efficient cycling of nitrogen, especially in tree-cereal intercropping systems and in riparian buffer systems. Preliminary modeled data suggests that in a tree-cereal intercropping system, nitrate leaching could be reduced to 50% compared to a conventional agricultural field. More research is needed to validate this hypothesis in tree-cereal intercropping systems and in riparian buffer systems. Research results may contribute significantly towards N_2O emission reduction efforts in agroecosystems. Therefore, in the above context, this is an immediate research priority.

d) The efficient filtering mechanism of tree roots could also potentially filter harmful organisms such as coliform bacteria, including *E.coli,* especially from manure runoffs and soil leachates. There is no research to-date that has investigated this low-cost but potentially efficient mechanism for enhancing water quality. Immediate research is needed in this area.

e) Remote sensing technology could be used in agroforestry-related land-use practices to study the long-term impacts of C sequestration both in trees and in soils under efficient nitrogen fertilizer management regimes. The University of Guelph Agroforestry Research Site (Victoria Road) has been selected as a 'test site' by the Centre for Research in Earth and Space Technology (CRESTech) to conduct remote sensing research applications using both airborne (Compact Airborne Spectrographic Image (CASI)) and spaceborne images (IKONOS satellite). Currently, the feasibility of using hyperspectral imagery to develop a model for carbon sequestration in tree-crop ecosystems is underway. This involves correlation of spectral "red edge" parameters with ground-measured quantities, such as variation in soil carbon content. CASI data will be used to generate chlorophyll pigment concentration maps; these will then be compared to C sequestration, ground-truthed. Further, Nitrogen (N) transfer from trees to associated crops will be determined by comparing CASI measurements of test plots of fixed N application to CASI measurements of the tree-crop plots. In this manner, N calibration of the hyperspectral data can be developed allowing better N fertilizer management in agroecosystems. This will also lead to quantification of the potential reduction in N_2O emissions from agroecosystems, a major source of greenhouse gas emissions. Quantification of carbon sequestration and reduction of N_2O emissions is the first step to demonstration of Canada's commitment to the Kyoto protocols.

Target Agencie(s): OMAFRA, University of Guelph, Agriculture and Agri-Food Canada, Centre for Research in Earth and Space Technology (CRESTech), Ontario Cattlemen Association, Dairy Farmers of Canada, Canadian Pork Council, Canadian Sheep Federation

Issue #2: Registration of Insecticides for Tree Nut Orchards

Background:

The Tree Nut Industry has considerable potential for growth, especially in southwestern Ontario. In order to ensure that the industry realizes its growth potential and is sustainable, research and support will be crucial over the next few years.

The Society of Ontario Nutgrowers (SONG) is the primary voice for the organized Tree Nut Industry in Ontario. OMAFRA has been working closely with SONG in order to help ensure that research needs are identified and met.

In Ontario, tree nut growers need improved access to pest and weed control products.

Recommendation(s):

a) That URMULE registrations of pest and weed control products identified in Appendix 2 of this report be pursued.

b) That any identified nutrient management issues in tree nut orchards be identified and addressed.

Target Agencie(s): OMAFRA, Agriculture and Agri-Food Canada

Issue #3: Registration of Herbicides for the Christmas Tree Industry

Background:

In Ontario, Christmas tree growers have very limited access to herbicides for use in their operations. Often weeds are present which cannot be effectively controlled by herbicides which are currently registered for use in Christmas tree plantations.

Problems with resident weed populations or weed shifts after initial treatment can significantly reduce the survival of planted seedlings. Growth performance of the outplantings as well as the quality of the trees can also be adversely affected.

Ontario's growers are at a competitive disadvantage with neighboring jurisdictions where growers have access to a broader selection of approved herbicides for use in their plantations.

Recommendation(s):

That the URMULE registration of several herbicides identified in Appendix 2 of this report for Ontario's Christmas tree industry be actively pursued.

Target Agencie(s): OMAFRA, Agriculture and Agri-Food Canada.

Issue #4: Approved and Safe Use of Chemicals in the Production of Maple Syrup

Description:

Many maple producers use defoaming agents to affect the boiling process when making maple syrup. There is a need to review the use of defoaming agents in the industry in order to ensure that their use is approved, safe and does not in any way contaminate the maple syrup.

In recent years, many maple producers in Ontario have moved to permanently installed tubing systems in their sugar bush. Research designed to evaluate alternatives to sanitize and clean maple tubing at the University of Guelph-Alfred Campus has been carried out since 1998 and a technical report summarizing the results is available. There is a need to further investigate treatment alternatives for sanitation and cleaning since some of the results from the initial study were not conclusive and also in the light of the information.

Recommendation(s):

a) Investigate alternative defoaming agents for the maple syrup industry

b) Investigate alternatives to sanitize and clean maple tubing for permanent tubing installations.

Target Agencie(s): University of Guelph-Alfred Campus; OMAFRA

Issue #5: Development and Use of the Health Spout in Ontario's Sugar Bushes

Background:

Over the past several years, research into a new smaller diameter "health spout" for the maple industry has been carried out in Vermont (Proctor Research Centre), New York (Uilein Maple Research Station) and Quebec (Centre Acer). This spout is 5/16 inches in diameter while the traditional spout is 7/16 inches in diameter. Preliminary research has shown that use of the health spout permits tapholes to heal over more quickly while maintaining about the same sap production levels as the conventional spout. Consequently, many maple producers are adopting the health spout.

Maple producers place high priority on maintaining the ongoing research into the health spout. There is also a need to develop a health spout for bucket operations since the existing health spout is suitable only for tubing installations.

It is important that maple producers be kept abreast of research into the health spout.

Recommendation(s):

To encourage ongoing research into the health spout and to transfer the results of this work to maple producers.

Target agencie(s): Cornell University; University of Vermont; Centre Acer; OMAFRA

Issue #6: Producing High Quality Maple Syrup and Maintaining it in Storage.

Background:

It is recognized within the maple industry that filtering up maple sap can potentially upgrade the quality of the sap as well as the syrup produced from it. There are a number of sap filters available to the maple industry designed for small and large operations.

There is a need to consolidate technical and economic information on sap filters and investigate the pros and cons of the different filter types. Proper methods for cleaning and storing the filters should also be reviewed. This work should raise producer awareness regarding the benefits of filtering sap. It should also help them select appropriate filters for their operation and provide them with information regarding proper maintenance and storage of the filter units.

There is a belief in the maple industry that manufacturing odors are present in most metal containers. There is a need to investigate the source of these odours as well as proper sterilization procedures.

The use of high pressure steam in the production of maple products has been an area of research focus in Ontario for several years. This technology has some advantages over more conventional processing technologies and is highly versatile. It may be possible to produce more of the higher grades of syrup with a stream installation and economies of production may be improved. Also, high pressure steam can be used to sterilize equipment such as sap collection tanks, syrup drums and buckets. There is a need to provide maple producers with access to technical information and sources of equipment and expertise. Also, the economics of using high pressure steam compared to conventional syrup production systems should be explored.

Recommendation(s):

a) That a comprehensive review of sap filters appropriate for use in the maple industry be undertaken

b) That the source and nature of odours in metal containers used for packing maple syrup be investigated.

c) That maple producers be provided with ready access to technical information on the use of high pressure steam in maple production.

d) That the economics of high pressure steam compared to alternative syrup production systems be investigated.

Target Agencie(s): OMAFRA; University of Guelph; North American Maple Syrup Council.

Issue #7: Determining the Nutrient Status of Maple Pure Maple Syrup

Background:

In order to support the growing demands of consumers, the Canadian government is considering the advisability of adding nutritional labelling information to containers of maple syrup produced in Ontario. Nutritional information for maple syrup produced in Ontario which could be used for this purpose is unavailable.

It will be necessary to collect information on the nutritional status of maple syrup which is sufficient to satisfy labelling requirements so that it is available if the requirement for including this information on the label becomes mandatory. This may include collecting information from other jurisdictions for comparative purposes.

Many maple producers view nutritional labelling as a positive thing and see that including this information on the product label may have marketing advantages.

Recommendation(s):

To obtain the information necessary to provide nutritional labelling for maple syrup produced in Ontario.

Target Agencie(s): OMAFRA; Agriculture and Agri-Food Canada

Issue #8: Summary of Research Findings: Sugar Bush Management

Background:

It is 25 years since a comprehensive consolidation and review of research findings pertinent to sugar bush management has taken place. There is a need to pull together the results of research, which has accumulated since 1975, and make the results of this work available to maple producers.

The Ontario Maple Syrup Producers Association has expressed special interest in any information related to the thinning of mature maple stands.

Recommendation(s):

That a literature search and synthesis of research information pertinent to sugar bush management be carried out.

Target Agencie(s): OMAFRA

Issue #9: Need to Continue Aspects of Ice Storm Recovery Research in Ontario

Background:

Following the ice storm of 1998 which affected eastern Ontario, the Ontario and Canadian governments received a Brief from the Ontario Maple Syrup Producers Association (OMSPA) requesting, among other things, assistance to research the affects of the Ice storm on sugar bushes. Subsequently, a comprehensive program was approved by the two levels of government and implemented commencing in 1999. This program included an evaluation of the effects of the ice storm on the productivity of sugar bushes, an evaluation of the nutritional status of sugar bushes and remedial treatments and other projects. This program which was supported using Disaster Relief Funding will be completed effective December 31, 2001.

In the OMSPA Brief, a commitment to research designed to monitor the effects of the Ice Storm on sugar bushes was requested for a minimum of five years. The Disaster Relief Programs did not allow for this length of program effort.

Recommendation(s):

a) The assessment of ice storm induced crown damage and its effects on root starch levels, sap production, sugar content and wound closure in sugar bushes be extended with re-measurement in 2003 and 2005.

b) That the assessment of the effects of ice storm damage on the nutritional status of maple trees are extended with re-measurement in 2003 and 2005.

c) That the value of fertilization as a remedial treatment for ice-damaged sugar bushes be determined.

d) That the incidence of damaging agents in ice-damaged sugar bushes – sugar maple borer, branch and stem decays be monitored.

e) That the impact of selected damaging agents on the health of ice-damaged sugar bushes be monitored.

f) That the effects of ice-storm induced crown damage on the microclimate of sugar bushes be determined.

Target Agencie(s): Ontario Forest Resources Institute-OFRI; University of Guelph-Alfred campus.

Priority grouping "B"

Issue #1: Vegetative Propagation of Maple Sweet Trees

Background:

Techniques to vegetatively propagate sugar maple have been successfully developed at Cornell University-Uilein Maple Research Station over many years. In 1998, a three-year study was initiated at the University of Guelph-Guelph and Kemptville locations to adapt the vegetative propagation technology to Ontario. The study showed that rooting of the vegetative material was highly dependent on the physiological condition of the scions when collected and the greenhouse misting regimen. Rooting success varied from poor to very good depending on the season.

Overwintering of the rooted plants proved to be the biggest challenge due to the fragility of the rooted material. The results of this study are summarized in a report entitled " Vegetative Propagation of Sugar Maple and Black Maple in Ontario".

The Ontario Maple Syrup Producers Association- Maple Orchard Committee is interested in continuing efforts to vegetatively propagate maple using scion selections from sweeter than average trees.

Recommendation(s):

To continue vegetative propagation work in Ontario using scions collected from sweeter than average maple trees.

Target Agencie(s): OMAFRA; University of Guelph; Private Nurseries

Issue #2: Investigation of a Vapour Compression System for syrup Production

Background:

A prototype vapor compression unit was tested at the Uilein Maple Research Station in Lake Placid, New York a number of years ago. The unit was expensive and applicable to large operations. Consequently, the technology never really took hold in the industry.

In 2001,a consortium of individuals with appropriate skill sets for evaluating the potential of Vapor Compression has come together. The intent is to develop and test a vapor compression system which would be appropriate to smaller operations and thus being more affordable. The Director of Maple Research at Cornell University is interested in collaborating on the project.

Recommendation(s):

That the advantages and potential of a Vapor Compression System suitable to a 1000-3000 tap maple operation be investigated.

Target Agencie(s): OMAFRA; Agriculture and Agri-Food Canada.

Issue # 3: Intercropping Focus

Background:

It should be recognized by agroforestry researchers that "multi-purpose food bearing trees", as defined by agroforestry researchers are referred to as "orchards" by agricultural industries and horticultural institutions. Intercropping has been and remains a traditional and applied practice in nut and fruit orchards during the establishment period.

Agroforestry researchers should consider refocusing their attention away from managed orchards to instead enhancing field crop production, pasture management, rural road, odor and livestock issues, and riparian situations.

Recommendation(s):

That agroforestry researchers consider placing more emphasis on enhancing field crop production, pasture management, rural road, odour and livestock issues, and riparian situations.

Target Agencie(s): Agriculture and Agri-Food Canada ; University of Guelph.

Issue #4: Need for Improved Understanding of the Relationship between Trees and Farm Drainage.

Background:

Agroforestry Best Management Practices such as windbreaks, riparian buffers and fragile land plantings are potentially in conflict with tile drainage. Too little is known about the interaction of tile drains and tree roots to allow extension personnel to make design and species recommendations with confidence in these situations. Farmers are left to weigh their need for drainage against the unknown impact of planting trees near their tile drains. Understandably, many farmers choose to play it safe by not planting trees in these situations. This diminishes opportunities for the application of Best Management Practices.

Therefore, more research is needed into the relationship between tile drains and tree roots, and the implications for Best Management Practices design and species selection.

Recommendation(s):

That research be encouraged which improves the understanding of the relationship between tree roots and tile drainage systems.

Target Agencie(s): University of Guelph, Agriculture and Agri-Food Canada.

Part 2. Service Needs

Issue #1: Support Facilitating Agroforestry Research Projects, and Transferring the Results of Research and Extension Activity to Farmers

Background:

Agroforestry Extension Specialists fill a critical role in helping ensure that the findings of ongoing research in Ontario and elsewhere are transferred into practice. Also, their support is needed to help identify research needs, facilitate the funding of research and provide technical guidance to farmers and researchers.

The role of Agroforestry Extension Specialists is also critical in the packaging and transfer of technical information to farmers.

Recommendation(s):

That the support provided for Agroforestry Extension in Ontario be continued.

Target Agency: OMAFRA

Issue #2: Need to Ensure an Adequate Supply of Genetically Appropriate Trees and Shrubs for Afforestation on farms and in other Rural Areas.

Background:

The role of trees and shrubs in helping fulfill environmental management needs is expected to increase over the next few years. There is growing awareness in Ontario regarding the role that trees and shrubs can play in carbon sequestration, maintaining adequate supplies of clean and fresh water, meeting nutrient management challenges on farms and for the retirement of fragile agricultural lands.

The demand for other more traditional values of trees, for example, timber production, wildlife habitat and their recreational value is also expected to grow modestly.

There is a need for effective public and private sector partnerships which will help ensure a continued supply of source identified and high quality nursery stock which is tailored to the many specific demands in rural Ontario.

Recommendation(s):

That steps to be taken to ensure an appropriate and sustainable supply of source identified native trees and shrubs is available to meet anticipated future demand in rural Ontario.

Target Agencie(s): Ministry of Natural Resources; Ministry of Agriculture, Food and Rural Affairs; Conservation Authorities

Issue #3: Need to Harmonize Grade Names and Standards for Pure Maple Syrup

Background:

The production and marketing of maple syrup is often viewed in an international context. An increasing number of Ontario's maple syrup producers are becoming involved in the exporting of the product.

At the present time, the grade names and standards applied for packing maple syrup can vary by jurisdiction. The extent of the problem is not fully known. The Ontario Maple Syrup Producers Association (OMSPA) has requested that the grade names and standards be reviewed with the view towards harmonization. OMSPA has made this recommendation to the International Maple Syrup Institute (IMSI) and IMSI struck a committee in the fall of 2001 to study the matter and bring recommendations to the IMSI Board of Directors.

Recommendation(s):

That the grade names and standards utilized for maple syrup internationally be reviewed with the view towards harmonization.

Target Agencie(s): OMAFRA, IMSI

Issue #4: Need to Develop a Comprehensive Policy to Support and Guide the Planting of Trees and Shrubs in Rural Ontario

Background:

The Ontario government has a long history of supporting the planting of trees on agricultural and other lands in rural Ontario in order to meet a variety of objectives. As early as 1880, the provincial legislature developed mechanisms to promote tree planting along roadways. The evidence of this very early effort still marks the rural landscape of southern and eastern Ontario.

Throughout the 1900's over one billion tree seedlings were produced for private land plantings through the provincial nursery system. In conjunction with the Agreement Forest Program and the Woodlands Improvement Act Program as well as in partnership with conservation authorities and the agricultural community, over 500,000 hectares of plantations were created.

Due to changing government priorities and fiscal constraints in recent years, most provincial level tree planting programs and supporting initiatives were curtailed in the 1990's. As a result, tree planting in rural Ontario has declined dramatically.

Recently awareness regarding the critical role trees can play in addressing environmental management issues such as global warming, water supply and quality as well as nutrient management concerns has increased. This has lead to a renewed interest in developing a comprehensive tree planting program for Ontario. The need for a comprehensive policy as well as the specific issues needing attention are outlined in two recent reports prepared by the Ontario Ministry of Natural Resources:

a) A Review of Current and Potential Seedling Production in Ontario.

b) Critical Review of Historical and Current Tree Planting Programs on Private Lands in Ontario.

The recommendations contained in these reports should be addressed through the development of a comprehensive tree planting policy for Ontario which addresses the needs of rural Ontario.

Recommendation(s):

That a comprehensive policy for tree planting be developed to support tree planting needs and guide tree planting activities over the next decade or more.

This policy should address the following specific items:

a) Need to outline the many benefits of tree planting in rural Ontario.

b) Need to address seed and nursery stock questions including appropriate seed sources for Ontario's climatic zones, best types of nursery stock, capacity of the private sector and administrative support needed.

c) Need for a reliable supply of source identified seed from native tree and shrub species adequate to supply the current and projected demands of rural Ontario.

d) Need to better identify lands available and suitable for tree planting in rural Ontario.

e) Need to better identify suitable species and calculate projected demand for nursery stock.

f) Need to determine appropriate pricing formula for nursery stock.

g) Need to consider the role and importance of natural successions of vegetation as an alternative to tree planting in same areas.

Target Agencie(s): Ministry of Natural Resources

MINOR USE PESTICIDE REGISTRATION WISH LIST TO OHRSCC & OPMRSC - 2001

Sub-Committee: Agroforestry **Submitted by: Todd Leuty/ Dave Chapeskie**

Over all Rating	Chemical Name	Brand Name	Company	Crop		Registration Status			Justification								
						CD N	USA	IR 4	1	2	3	4	5	6	7	8	Other
Example	imadacloprid	Admire	Bayer	Grape	Grape and potato leafhoppers	✔	✔	C	X			X		X	X	X	New varieties planted more susceptible
Insecticides and Acaracides																	
1	Superior Oil 70	Superior Oil	Bartlett	Tree nuts	Aphids, mites, scale	√	√	P	X		X		X	X	X		New commercial nut crops, 2500 acres and increasing annually. Excellent fresh market potential.
2	Bacillus thuringiensis	Dipel	Abbott Labs	Tree nuts	Spring feeding caterpillars	√	√	P	X		X		X		X		
3																	
4	Indoxacarb	Avant	Dupont	Walnuts	Husk maggot, codling moth, Plum curculio			P			X	X	X		X		Only azinphosmethyl currently reg. English and Japanese walnuts showing good potential industry
5	Thiamethoxam	Actara, Cruiser,	Novartis	Tree nuts	Leafhopper, Plum curculio, aphids.			P	X		X		X		X		
6	Pyriproxifen	Distance, Knack, Esteem	Valent	Walnuts	Codling moth			P			X		X		X		
Fungicides																	
1																	
2																	
3																	
4																	
5																	

Justification Reasons:

1. No pesticide registered to control this pest.
2. New introduced pest problem
3. New crop.
4. EBDC fungicide replacement or OP insecticide replacement.
5. Resistance management tool
6. More effective therefore pesticide reduction.
7. Reduce risk product or support new IPM approach ie. Predictive models, pheromone control program
8. Export crop: need to harmonize pest control options or establish a crop tolerance.

Registration Status:

IR 4 Codes: I means In-Progress; C- completed and submitted to EPA; P means proposed but not approved or started yet.

APICULTURE & POLLINATION

ISSUE 1: A Sustainable Applied Research/Tech Transfer Position for Apiculture.

The Tech-Transfer Program conducted for the past seven years under the direction of the OBA and financed by a yearly grant from OMAFRA has contributed greatly to the stability of the beekeeping industry in Ontario by dealing with the immediate problems of the industry. The Tech-Transfer person has taken a new position at Rutgers University in New Jersey. The experience of the last seven years shows that industry directed research is effective. The industry has been working along with the Minister of Agriculture and Rural affairs in order to try to establish an Applied Research/Tech Transfer Position for Apiculture for the long-term.

ISSUE 2: Development of Varroa Mite-Resistant Bee Stocks Using Different Selection Approaches and Integrating Resistance into Ontario Tracheal Mite-Resistant Existing Bee Stocks. Varroa mites continue to be a major concern. These mites can annually kill 50-70% of bee colonies if infested colonies are not treated. Breeding bees resistant to varroa is the long-term solution to this problem. Research has shown that hygienic behaviour, grooming behaviour, and low mite reproduction are important natural traits possessed by honey bees for varroa control. We need to continue the selection program for breeding these traits into the Ontario tracheal mite-resistant bees to reduce the effect of Varroa in Ontario. Thus, Ontario bee stocks will be resistant to both mites and beekeepers will gain the benefits of using these bees in the IPM program.

Research Inventory: These three items have been part of the OBA Tech Transfer Program and need to remain as priority items. Projects were initiated to bring bee stock from France and the Russian stock from the USA. The importation of the Russian Bee Stock needs to continue as long as the US project keeps releasing new genetic lines of this stock. This should be added to the OBA Tech Transfer program as a priority.

Gap/Barriers/Opportunities: The development of resistant stocks to mites is tedious and expensive process. It requires a long period of time for selection, development and implementation. In the USA, there have been two programs conducted by Drs. Rinderer and Harbo at the USDA laboratory to develop varroa resistant bees. These stocks have been released in the USA for use by beekeepers. We have personnel who are trained in the use of instrumental insemination techniques for breeding. This allows the transfer of genetic materials (eggs and semen) without bringing any other possible pests and diseases. This research is well under way but more resources are needed to complete this project. We can take advantage of this progress by continuing to import eggs and semen from these stocks into Ontario. The additional import should now be carried on by the Tech-Transfer project. This project will make the development of resistant stocks less expensive since the USA researchers have done the initial research.

ISSUE 3: Further Development of an Effective Integrated Pest Management (IPM) Program for Controlling Parasitic Mites Small Hive Beetles and Infectious Diseases of Honey Bees. Apistan® currently is effective on varroa mites in most of Ontario.

Resistance has been shown in the Cornwall area. The continuous use of Apistan® on varroa will lead to the development of resistance across the province. Development of new miticides to be alternated with Apistan® will help to reduce the emergence of resistance to Apistan®. We have developed an effective single application method for Formic Acid to be used in rotation with Apistan®. However, Apistan® is nearing the end of its life expectancy. Therefore, we need to find a replacement strategy for Apistan®. If possible it would be good to develop other "softer" chemical controls that work in Ontario i.e. oxalic acid or non-chemical methods like screened bottom boards and drone brood removal.

Terramycin resistant strains of American Foulbrood have been found in parts of Canada on a large scale. It has not been found yet in Ontario. There is a need to develop an IPM strategy to deal with AFB.

Research Inventory: The IPM program for Varroa and Tracheal mites has been part of the OBA Tech Transfer Program. The development of the IPM component for AFB is new addition to this program. Therefore, the IPM program remains as an important priority issue.

Gap/Barriers/Opportunities: Recent research by the OBA Tech-Transfer program has shown that Oxalic acid is a promising chemical to be used for varroa control. More research is needed to study the side effects on bees and to try to register this product to use in honey bee colonies. Other tools can also be evaluated against mites.

ISSUE 4: Concern over how Imidocloprid affects honey bees. The beekeeping industry requests that the regulatory agencies of PMRA and Ontario Ministry of Environment request independent studies on Imidocloprid on non-target organisms before registering this product for use.

Research Inventory: There has been some research conducted on this area but it is still very controversial between the scientist wither sub-lethal effects are bringing about the loss of colonies that the French beekeepers feel directly relates to this product.

Gap/Barriers/Opportunities: Independent research projects to answer the question of are these sub-lethal effects of real concern for beekeepers?

ISSUE 5: Quality of Hive Products to Meet Consumers Expectations. The continuous use of miticides and antibiotics in bee colonies increases the risk of contaminating the hive products (honey, wax, and propolis) with residues. If the residues exceed the allowed limits the products cannot be marketed. Monitoring residues in hive products needs to continue to ensure high quality and no contaminates as expected by the consumers.

Research Inventory: As each new product or method of application is developed for a specific problem, the residue work must be done. Once the product is on the market follow up surveys are necessary to see if over time accumulation of the product is occurring.

Gap/Barriers/Opportunities: The cost of sample analysis is very high although this issue is an important issue for food safety and quality. More resources need to be allocated for monitoring program to ensure food quality. Finding any residues will effect marketing of hive products. It also can be a concern for consumers.

ISSUE 6: Maintenance of the Apicultural Regulatory and Extension Programs in Ontario. The Apicultural Regulatory and Extension Programs have played an important role in the beekeeping industry in Ontario. New problems such as resistance of Varroa to Apistan®, SHB and the possibility of resistant AFB are important issues that could seriously affect the beekeeping industry. Inspection and monitoring of diseases and pests have become very important in implementing the IPM program in areas where it is needed. Educating beekeepers about new techniques for management of bee diseases and pests remains critical across the province

Research Inventory: OMAFRA has a Provincial Apiarist and 22 part time bee inspectors. These personnel are deployed across the province to inspect, monitor, and educate beekeepers.

Gap/Barriers/Opportunities: With the finding of new pests and diseases just across the US border, the Apiculture regulatory and extension program has become very important to the beekeeping industry. This team has tremendous experience in sampling and monitoring pests and diseases. Additional hours available in this program area would help to maintain the industry ahead of the potential problems.

ISSUE 7: Registration of CheckMite™ (Coumaphos). This pesticide is the only registered product for controlling the small hive beetle in the world. It is also effective against Varroa. So far, we have only Apistan used for Varroa control. We support registration of CheckMite™ to have in place an alternate control the SHB and Varroa in Canada.

Research Inventory: Beekeepers have some concerns about this product but this is the only product registered in the world to control the Small Hive Beetle. We encourage finding a safer, friendlier product to be used for the Small Hive Beetle.

Gap/Barriers/Opportunities: Dr. Don Wilson of Bayer has worked on registration of CheckMite™ (Coumaphos. Now that resistant Varroa has been determined, he will be in a position to advance the registration package.

ISSUE 8: Federal Registration of Formic Acid Mite-Away. This product can be used under the current exemption of formic acid as allowed by the PMRA. A full registration would be more desirable. We support the full registration of Mite-Away.

Research Inventory: The OBA Tech-transfer specialist has developed of the Formic Acid Mite-Away pad.

Gap/Barriers/Opportunities: Beekeepers have been using Mite-Away for tracheal and varroa mite control. The use of the pads is covered under the PMRA memorandum for use of formic acid in bee colonies in Canada. NOD Apiary products is pursing the full registration of this product. The beekeeping industry supports the full registration of this product to be added to the approved tools for the IPM program.

ISSUE 9: Monitoring for Varroa Resistance to Apistan®. The development of resistance to Apistan® by varroa mites is expected. Continuous monitoring of the efficacy of Apistan® and resistance by mites is a very important issue. Beekeepers would not like to be surprised by the fact that varroa has survived the treatment and killed their colonies.

Research Inventory: The OBA Tech-Transfer program has been monitoring resistance across Ontario. The Apicultural Regulatory and Extension Programs in Ontario are involved in the monitoring process.

Gap/Barriers/Opportunities: the USA beekeepers were taken by surprise when mites developed resistance to Apistan®. They lost thousands of bee colonies because Apistan® did not kill resistant varroa mites. In Ontario, early detection and continuous monitoring of varroa resistant to Apistan® is important. We can avoid the loss of bees by using other methods to control mites. Since we have only formic acid and Apistan®, it is important to monitor resistance.

ISSUE 10: Registration of Tylosin and Lincomycin The development of resistance to Oxy-tetracycline in Canada is a real concern.

Research Inventory: Research has been done in United States to show that these two products are safe and efficacious for controlling r-AFB and residues are not a problem.

Gap/Barriers/Opportunities: The Provincial Apiarist is working with Beaverlodge Research Station, CHC and the two companies to bring about the registration of these products. These products once registered will be recommended to Ontario beekeepers in an IPM Program to rotate all three so we do not develop resistance to any particular one of them.

ISSUE 11: Continued support for the ban on the importation of honey bees to Canada from mainland United States.

B – POLLINATION ISSUES

ISSUE 1: Management Strategy for Machine Harvested Cucumbers. Cucumber is a crop grown in south - western Ontario. Large acreage has been grown every year. The pollination requirements are not well defined. To ensure high quality crop, pollination is needed. Studying factors affecting pollination efficacy and requirements is needed to serve both cucumber growers and beekeepers.

Research Inventory: the University of Guelph, Pollination laboratory has the trained expertise in the field of pollination ecology and biodiversity. So far, the cucumber growers and beekeepers to solve this issue have sponsored research.

Gap/Barriers/Opportunities: More research funds are needed to be allocated to conduct the necessary research. The OMAFRA research program at the University of Guelph can focus on providing some resources to study this problem. Any increase in cucumber pollination will help increase the cash return to beekeepers and growers.

ISSUE 2: Pollination Requirements of New Varieties of Apples. Mites have exterminated feral honey bees. This part of the pollinator force available for crops has disappeared. Wild bee populations have also been extensively reduced. High-density apple orchards are annually increasing. Therefore, the apple pollination requirements should be reevaluated. Examination of genotypes of apple seeds in ripe fruit to map and quantify the extent of gene and pollen movement in orchards is needed.

Research Inventory: the University of Guelph, Pollination laboratory has been working on this issue.

Gap/Barriers/Opportunities: Financial support from the industry and the OMAFRA program at the U of G are needed. The OMAFRA research program at the University of Guelph stopped their support in 1999-2000.

ISSUE 3: Produce a Best Management Practice Strategy for Pollination Management. Pollinators require efficient management protocols. These management practices help to mobilize strong healthy bee colonies for pollination. These pollinators also need protection from pesticides when they are pollinating plants.

Research Inventory: the University of Guelph, Pollination laboratory has been working on this issue.

Gap/Barriers/Opportunities: Financial support from the industry and the OMAFRA program at the U of G are needed. This may have detrimental effects on research on this area.

ISSUE 4:_The importance of actively encouraging education and research on alternative pollinators.

Research Inventory: Major global changes in the environment have occurred in the last 50 years and are expected to continue with rapidity (*Science*, July 25, 1997). In parallel with this, there may be a growing recognition by beekeepers, agriculturists, botany and zoology researchers, natural history societies and the public that the fate of the environment and the future of agriculture cannot be separated.

Recent published work by Peter Hallett (University of Toronto) in the *American Bee Journal* (2001, Feb, Mar, May, Jun) documents and illustrates a new method for managing solitary bees and wasps. This could be the basis of undergraduate, graduate research projects or even of a year round highschool projects involving the biology, woodworking and math departments.
The method uses hives loaded with transparent-topped trapnests, and mounted on a platform on greased poles. The use of objective interim names, based on naked eye features of the nests, eases the problem of insect identification. The filled nest blocks could supplement information displays in commercial Honey Houses. The solitary wasps are a spin-off with pest management potential.

It is recommended that P.E. Hallett bring these issues forward for advice from the Universities of Toronto and Guelph, AAFC (Saskatoon), the Ontario Beekeepers Association, the Toronto School Board, the Federation of Ontario Naturalists, and the Toronto Entomological Society. He should report next year in writing on the feasibility of improving and extending research and education on solitary bees and wasps within Ontario, and on the possibilities for development of mass nesting materials.

APPLE

Apple Issues and Research Issues Ranked in Priority (Jan. 2002)

Sustainable I.P.M. Systems

1. Fireblight strategies with impending loss of Streptomycin
2. New and Emerging Pests (OFM, OBLR, Dogwood Borer, Sawfly)
3. Alternatives to Organo phosphorus and Carbamate insecticides
4. Resistance Management of Insect pests
5. Disease Management Strategies

Post Harvest Strategies for Quality and Safety Assurance

1. Disease Control, Fungicide Resistance
2. Storage Technology, 1-MCP

Production Management

1. Cultivars
2. Thinning and Growth Regulators
3. Rootstocks and systems
4. Nutrient Management

Apple Industry Issues (Jan. 2002)

Apple Issue #1 - Sustainable I.P.M. Systems

1.The Importance of Streptomycin for controlling Fire blight

Currently, PMRA is considering canceling the registration of streptomycin. Streptomycin is the most effective chemical registered to control *E. amylovora*, a bacteria that attacks apples and pears during the blossom stage. *E. amylovora* can spread quickly within and between orchards, killing trees and decimating entire orchards. In 1991 a severe outbreak of fire blight in Ontario resulted in significant tree death in Southwestern Ontario.

In order to remain competitive on the global market growers have begun planting high density orchards, with newer varieties that receive a price premium. These rootstocks and varieties that are in high demand by consumers, are susceptible to infection by the bacteria during the blossom stage. Currently 84.7% of apple trees in Ontario are grown on rootstocks that are considered to be moderate to highly susceptible to fire blight. Also 64 % of the varieties of apples grown in Ontario are considered to be moderate to highly susceptible to fire blight bacteria. An outbreak of fire blight in Ontario orchards would result in significant economic loss to the apple and pear industry.

Current Research Activities

John Cline (Uof G) is currently conducting research looking the influence of Apogee and rootstock on secondary fireblight infection, as well as examining the susceptibility of rootstocks to fireblight at rootstocks and susceptibility to fire blight. Dan Brown and Antonet Svirceva (AAFC) are conducting an ongoing project looking at the control of fireblight by a protein that induces the systemic acquired resistance in the tree. Peter Sholberg (AAFC, British Columbia) is currently evaluating the use of BlightBan in the orchard.

Gaps/Needs/Barriers

Streptomycin is the only product currently registered that can provide adequate control of fire blight in Ontario. Currently the PMRA is considering canceling the registration of streptomycin. There are no products under development that are considered to be viable replacements for streptomycin. It is essential that PMRA continue to maintain a temporary registration of streptomycin until a viable alternative is registered to control fire blight.

Apogee and BlightBan are not considered to be viable alternatives to the use of streptomycin, since they only control one stage of fire blight. Apogee controls fire blight at the shoot blight stage, while BlightBan controls the blossom blight stage. However, the registration of Apogee will provide protection against secondary infections later in the season. The registration of Blightban would allow growers to use this product in conjunction with streptomycin at bloom thereby reducing the number of applications of streptomycin.

2.De velopment and evaluation of sustainable IPM programs that address the dynamic arthropod and disease complexes in apple production systems.

The Issue

The development and evaluation of sustainable, economically viable IPM program requires an understanding of the dynamic arthropod complexes (insects and mites) of pests and beneficial organisms within the agro-ecosystem. The orchard ecosystem can easily be disrupted by altering the pest/disease complex.

As we continue to replace broad spectrum chemicals with newer more target specific chemistries, we will begin to see changes within the orchard ecosystem. Secondary pests that have been previously controlled by sprays for other pests, may become new and emerging pests.

The following pests are considered to be new and emerging pests in apple orchards:

a) Oriental Fruit Moth (OFM)

- In 2001, there were no registered products available to control this pest.
- Growers have experienced up to 40% damage from OFM at harvest.
- OFM is present in 3 of the 5 major apple growing regions of Ontario (Norfolk, Essex/Kent, Niagara)
- Isomate M 100 (a mating disruption pheromone) has recently received a temporary registration, however we don't have a good understanding of how this product will fit in the existing apple IPM program. Recommendations for its use in Ontario peach IPM programs include the use of an insecticide (Lorsban) to reduce first generation population density. A similar product or products should be tested and evaluated for apple.

b) Dogwood Borer

- Injury from this pest has increased steadily in Ontario apple orchards in the last decade.
- There has been an increase in high density plantings, which are highly susceptible to this pest.
- Dogwood borer injury weakens the trees making them more susceptible to disease, drought, and winter injury.
- A 2000 survey suggested that this pest is present in almost 100% of the high density orchards in Ontario.

c) European Apple Sawfly (EAS)

- EAS has become an increasing problem in Eastern Ontario, over the past decade.
- Prior to 1998, damage from this pest was only found in the Ottawa Valley and Brockville, however, it has now spread as far west as the Waupoos area of Prince Edward County. This fall, damage from this pest was found in the Brighton area
- Pest populations were very high in some areas in 2001, however harvest assessments did not detect EAS damage.

d) Oblique-banded leafroller

- The obliquebanded leafroller has developed resistance to organophosphate insecticides in a significant portion of the apple growing areas in Ontario (50% of the growing area).

The apple IPM program is constantly evolving to ensure that the products used are economically and environmentally sustainable. New and upcoming products must be evaluated for their suitability for incorporation into the existing IPM program.

Current Research Activities

In 2001 OMAFRA conducted preliminary investigations on OFM and EAS to get a better understanding of the significance of these pests to the apple industry. Research is currently being conducted to examine the use of mating disruption to control Dogwood Borer and the Oblique-banded leafroller.

Gaps and Barriers

Oriental fruit moth

- Creation of a predictive developmental model based on degree-day accumulations to provide optimal timing of the application of pest control products.
- Information needs to be collected about the varietal preferences of OFM
- Data needs to be collected regarding the efficacy of new products (Intrepid, Isomate M100), against OFM as well as their potential role in IPM programs.

Dogwood Borer

- Pounce, is the only product registered to control this pest.
- New chemistries and non-chemical alternatives may provide better alternatives for controlling this pest, while minimizing the negative effects on environment.
- Mating disruption has been used successfully in the US, and should be made available to Ontario growers.

European Apple Sawfly

- Monitoring for EAS must be continued in order to assess the spread of this pest to other apple producing areas.
- Guthion (an organophosphate insecticide) is the only product registered to control this pest. This product is currently under re-evaluation by the PMRA, and the registration of the product may be discontinued.
- It is important to look into the use of new chemistries, and non-chemical controls (beneficial nematodes or fungi), to replace the use of OP's for controlling this pest.

Oblique-banded leafroller

- We need to assess the role of newly registered products in the Ontario Apple IPM program.
- The registration of mating disruption products would provide growers with important tools to control this pest.

3) Providing Alternatives to Organophoshates and Carbamates

The PMRA is currently conducting a re-evaluation of the organophosphates(OP) and carbamates (CA) registered in Canada. As a result of this re-evaluation the use of these products may severely restricted or may be discontinued entirely. The Ontario apple IPM program relies heavily on the use of OP's and CA's. The loss of these chemicals would require significant changes to the apple IPM program. Organophosphates are considered to be the only effective products in controlling many key pests in apple such as Plum Curculio, Apple Maggot, European Apple Sawfly and San Jose scale. Carbamates such as Sevin, are used throughout the province for fruit thinning. In anticipation of these regulatory changes, we must begin to look at the efficacy and sustainability of alternative chemistries.

Current Research and Activities

OMAFRA, AAFC and private consultants are currently looking at the efficacy of newer chemistries and non-chemical alternatives (mating disruption) for several pests (obliquebanded leafroller, dogwood borer, and oriental fruit moth).

Gaps/Barriers/Deficiencies

Efficacy trials need to be conducted to examine the efficacy of new chemistries and non-chemical alternatives for Plum Curculio, Apple Maggot, European Apple Sawfly, and San Jose Scale. We must also determine potential role these new chemistries may play in the existing IPM program.

4) Developing Strategies to Manage Pesticide Resistance

A number of pests in Ontario apple orchards have developed pesticide resistance. As a result Ontario growers have begun implementing procedures to avoid the development of pesticide resistance.

Current Research and Activities

OMAFRA encourages growers to: 1)apply insecticides only when pest populations have reached threshold, 2)rotate chemical families, 3)use non-chemical controls wherever possible.

AAFC is currently conducting research examining the development of resistance in OBLR, and developing resistance management strategies.

Disease Management

Apple scab is an important disease of apples that can result in significant economic losses. The existing control strategy for scab involves multiple applications of fungicides from green tip until harvest. This control strategy is time consuming and costly to the growers. This program also may have negative connotations from the consumer in regards to food safety, and effects on the environment.

The registration of newer more narrow spectrum fungicides, such as strobilurins and sterol inhibitors are less effective in protecting the fruit, and may result in epidemics of other foliar or fruit diseases such as black-rot, flyspeck and sooty blotch. The use of these new fungicide families in Europe and the US has resulted in an increased risk in the development of pesticide resistant scab populations.

Current Research and Extension Activities

None

Gaps/Barriers/Deficiencies

Each of these fungicides are very different in their characteristics, and as a result they can be used to together to provide growers with season long scab control. However we need get a better understanding of characteristics of these fungicides to evaluate their role in the existing Ontario IPM program.

Apple Issue #2 - Postharvest Strategies for Quality and Safety Assurance

The Issue

Consumers now recognize that freshness and flavor are major constituents of product quality, and that firmness best characterizes freshness. The industry needs to examine all factors that can affect firmness, from orchard practices right through to storage, transport and market.

Other major storage problems include superficial scald and storage rots. The superficial scald, a chilling-like physiological disorder that develops during storage, leads to considerable wastage. Significant crop losses, due to an increase in storage rots, have been reported in apple storages in Southern Ontario in the 2000-2001 stored apple crop. Among the different postharvest pathogens of apple, *Penicillium expansum* (causes blue mold) and *Botrytis cinerea* (causes gray mold) are the two most devastating pathogens worldwide.

Current Research / Extension Activities

Work by OMAFRA (DeEll) and the University of Guelph (Murr) is focused on retaining as much as possible of the 'at harvest' flesh firmness, using some of the new or developing technologies, such as 1-methylcyclopropene (Smart Fresh^{TM}), programmed controlled atmosphere (CA) storage and initial low oxygen stress. Other work involves managing superficial scald and other storage disorders.

In the fall of 2001, a preliminary investigation has been initiated by AAFC (Errampalli) to determine the causes for increase of postharvest diseases, blue mold and gray mold, in stored apples

Gaps / Barriers / Deficiencies

The research on postharvest physiology of apples also needs to emphasize the interaction of these technologies with handling and storage practices that are used by industry (e.g. fruit maturity at harvest, fruit cooling rate, etc.), and should be expanded to include research using cultivars that are just coming into production in Ontario (e.g. Honeycrisp).

Research should also continue on low oxygen and other non-chemical alternatives to prevent scald development during storage. The potential benefits of ReTain application (to delay harvest maturity and to cold-acclimate fruit in the orchard) and/or 1-MCP, and their synergy with low oxygen and programmed CA regimes, on reducing scald in sensitive cultivars needs to be determined.

The research on postharvest diseases of apples also needs to focus on identifying alternative control methods to two chemicals, thiabendazole (TBZ, a postharvest fungicide), and diphenylamine (DPA, anti-scalding agent), that are currently being used for control of postharvest rots in apple. It has been shown that *P. expansum and B. cinerea* have developed resistance to TBZ and DPA in New York state and British Columbia. Biological control of postharvest disease of fruits and vegetables by antagonistic microorganisms seems increasingly promising to replace or integrate the use of synthetic fungicides which are subjected to limitations due to development of fungicide–resistant strains of the pathogen. The efficacy of biological control agents and chemical control methods for the control of blue mold (*P. expansum*) and gray mold (*B. cinerea)* of apple in cold and CA storages needs to be determined.

Due to consumer demand, new apple varieties are being introduced into the market. The knowledge of cultivar resistance to postharvest diseases is important to maintain the product quality. Research, therefore, is needed to determine the susceptibility of new apple cultivars, such as cvs. Honeycrisp, Ambrosia, Ginger Gold and Royal Gala, to postharvest pathogens. In addition, the effect of new postharvest technologies such as, 1-MCP, on blue mold and gray mold needs to be investigated.

Apple Issue # 3 - Production Management

The Issue

The Ontario Apple industry is competing on a Global scale for markets at home and offshore. Some segments of the marketplace can be described as **hyper-competitive** and requiring constant adjustments to consumer taste with new cultivars and quick responses to new growing concepts and regulations. Growing protocols require consistent and continuing refinement to serve the grower in order to compete in the marketplace and follow suit with world trends.

Current Research/ Extension Activities

- Apple **Rootstock Physiology** – Looking at the performance of various rootstock/scion combinations under different orchard management systems with emphasis on winter hardiness, Fireblight susceptibility, precocity and productivity. One important feature of this program is the commercialization of the Vineland Series rootstocks.(Cline)
- **Tree Physiology** and the influence of Plant Bioregulators (PBR) to regulate cropping, improve production efficiency, and fruit quality (Cline)
- **Mineral Nutrition** effects on apple fruit quality and tree growth (Cline)

- Beneficial uses of **Organic Amendments** for reducing soil borne disease and herbicide usage for the improvement of fruit quality and plant health (Cline)
- Assessment and **adaptation of apple fruit cultivars** with a range of ripening dates useful for fresh market production (Cline)
- The **Ontario Apple Team** carries on in a support and developmental function for most of the activities described above. This team is also responsible for the Orchard Network Newsletter, Apple programs like the OHC Apple Day, Production Recommendations like Pub 360. The team is active in speaking engagements and training sessions for industry across the Province and out of Province (Gardner, Appleby, Huffman, DeEll, Carter, Henderson and associates in Crop Technology).

Gaps Barriers/ Deficiencies
With the continued introduction of new varieties, cultivar specific recommendations require continued refinement. To develop a crop load management strategy for any one new variety can take a minimum of 3-4 years to refine. This can involve the testing and application of several thinning treatments over a wide geographic area and with various tree ages. Ontario apple acreage is concentrated in several large and climatically distinct growing regions. This adds complexity to the situation as products and processes are highly dependent on climate and weather for response. Non carbamate dependent thinning strategies are also needed as this insecticide is on review and could be seriously restricted as an option in the near future.

More work is required in the future to better the understanding of organic and IFP production systems. This is not just about sprays but does involve looking at disease resistant germ plasm in cultivars and rootstocks as well as alternative ways of dealing with competition from vegetation and ground cover management. Mulching systems and soil amendments for disease control and nutrient supply have not yet been fully explored.

Gaps and barriers in research may broaden in the near future because of lack of industry structure and ways and means of matching research dollars. With the dissolution of the apple commission, funding and support by the growers organization for research on apple is in jeopardy. Currently, the apple researcher Dr. John Cline is split 60/40 between apple and Tender fruit with various projects on cherry peach etc. in addition to a baseline level of research activities on apple.

Planting systems and nutrient management also require constant refinement and testing to determine best fit and best returns on investment. The Vineland series of rootstocks are showing great promise in terms of hardiness, precocity, yield and disease resistance in Ontario and in the USA. Further work is necessary to research the capabilities of various rootstocks/cultivar combinations especially with the change in landscape regarding fire blight and imminent loss of antibiotics to fight infection.

MINOR USE PEST CONTROL PRODUCT REGISTRATION WISH LIST – APPLE

Overall Rating	Target Pest(s)	Crop or Crop Group	Potential Solutions (active ingredient)	Potential Solutions (trade name)	Company	Registration Status*			Justification(s) for high ranking***									
						CDA	USA	IR-4**	1	2	3	4	5	6	7	8	9	Other
Example	*OBLR, leafhoppers, codling moth, plum curculio*	*Apples (Pome fruit)*	*kaolin clay*	*Surround*	*Engelhard*		*X*	*C*					*X*	*X*				
[illegible] Priorities																		
1	**OBLR, OFM, Lepidopteran pests (codling moth)**	*Apples (Pome fruit)*	**Methoxyfenozide**	**Intrepid**	**Dow Agro**	**I?**	**C**		**X**	**X**	**X**	**X**	**X**					**Replaces use of OP's for CM.**
2	**Plum Curculio, Apple Maggot, Codling Moth**	*Apples (Pome fruit)*	**indoxacarb**	**Avaunt**	**DuPont**		**I**				**X**	**X**	**X**					**Replaces use of OP's.**
3	**Oriental Fruit Moth**	*Apples (Pome fruit)*	**OFM pheromone dispensers**	**Isomate-OFM Rosso**	**Pacific Biocontrol (ShinEtsu)**		**C**		**X**	**X**	**X**		**X**	**X**				
4	**Oblique-banded leafroller**	*Apples (Pome fruit)*	**OBLR pheromone dispensers**	**OBLR pheromone**	**3M**		**C**						**X**	**X**				
5	**Dogwood Border**	*Apples (Pome fruit)*	**Borer pheromone dispensers**	**Greater peach tree borer pheromone**	**ShinEtsu**		**C (on peach)**				**X**		**X**	**X**				**Alternative to pyrethroid trunk sprays**
6	**European Red Mite, Two Spotted Spider Mite**	*Apples (Pome fruit)*	**Bifenazote**	**Acramite**	**Crompton**		**C**					**X**						
7	**Codling moth, San Jose scale, leafminer**	*Apples (Pome fruit)*	**pyriproxifen**	**Esteem**	**MGK/Valent, IR-4**		**C**				**X**							**Alternative to OP's to control Codling moth and San Jose Scale**
8	**Codling Moth, Plum Curculio, Apple Maggot, Leafrollers**	*Apples (Pome fruit)*	**Kaolin clay**	**Surround**	**Engelhard**		**X**	**C**					**X**	**X**				**Is a key product for organic growers. May play a role in the ON IPM program.**

Overall Rating	Target Pest(s)	Crop or Crop Group	Potential Solutions (active ingredient)	Potential Solutions (trade name)	Company	Registration Status*			Justification(s) for high ranking***									Other
						CDA	USA	IR-4**	1	2	3	4	5	6	7	8	9	
Plant Pathology Priorities																		
1	**Fireblight**	*Apples (Pome fruit)*	**Prohexidione-Ca**	**Apogee**	**BASF**		C		X ?									**Important if streptomycin is lost. However, it does not provide adequate control.**
2	**Fireblight**	*Apples (Pome fruit)*	**Pantonea agglomeranes**	**BlightBan**	**Plant Health Technologies**		C		X ?									**Important if streptomycin is lost. However, it does not provide adequate control.**
Weed Science Priorities																		
1	**Pre-emergence, broadleaf and grasses**	*Apples (Pome fruit)*	**azafenidin**	**Milestone**	**Dupont**							X						
2	**Roundleaf Mallow**	*Apples (Pome fruit)*	***Colletrichium spp.* (biocontrol product)**	**Mallet**	**Encore Technologies**							X						
Plant Growth Regulators, Other priorities																		
1	**Ethylene Action Inhibitor**	*Apples (Pome fruit)*	**1-MCP**	**SmartFresh**	**Rohm and Haas**		I		X	X								
2	**Vegetative growth control**	*Apples (Pome fruit)*	**Prohexidione-Ca**	**Apogee**	**BASF**		C		X									
3	**postharvest**	*Apples (Pome fruit)*	**fludioxonil**	**Scholar**	**Syngenta**		C											

* Registration status: Product/Active registered in Canada for another crop; Product and use registered in USA

** IR-4 Status: I = In progress
C = Completed and submitted to EPA
P = Proposed but not approved or started yet

*** Justifications:

1. No pest control product registered to control this pest
2. New introduced pest problem
3. Old technology replacement (organophosphate, carbamate, EBDC, etc)
4. Resistance management tool
5. Reduced risk, biopesticide or GRAS (generally regarded as safe) product
6. Supports a new IPM approach (pheromone mating disruption, etc.)
7. Export crop with need for harmonized pest control options and crop tolerances
8. More effective therefore leading to pesticide reduction
9. New crop

BERRY CROPS

This committee has, over the years, developed a set of long-term research priorities. With the increasing costs of production and changing consumer attitudes, food safety, water quality and maintaining sustainable crop production systems are critical to the industry. Many of these are short-term goals and positive results can be developed in 4-5 years. That said, breeding new berry cultivars remains a long-term and on-going priority for the industry which cannot be stopped and started at will. Superior cultivars with disease resistance and high quality fruit are the cornerstone of a sustainable production system.

1. **Develop sustainable crop production systems for berry crops in Ontario through breeding (long-term) and applied research (shorter-term) programs:**

- Develop integrated weed control strategies for reduced pesticide use and crop losses in strawberries and raspberries.
- Breed and select new strawberry and raspberry cultivars with improved quality, yield and pest resistance.
- Develop nutrient recommendations for macro- and micro-nutrients of berry crops under different production and irrigation systems. The first priority should be the uptake and removal of nitrogen and then phosphorous.
- Develop extended-season cropping systems for strawberries and raspberries including new varieties, plasticulture, dayneutrals, greenhouses, etc.
- Develop integrated pest management options for strawberry and raspberry diseases and insect pests including the following on strawberries - anthracnose fruit rot, tarnished plant bug, 2-spotted spider mite, cyclamen mite, angular leaf spot, and root weevil, and the following on raspberries - cane diseases and fruit rots.
- Develop virus detection methods and determine the incidence of virus diseases in strawberries and raspberries in Ontario.
- Develop biological mite control strategies for raspberries.
- Determine economic thresholds for the control of foliar diseases of strawberries (ie leaf scorch, leaf blight and powdery mildew).
- Develop effective, cost-efficient bird control strategies for blueberries.

2. **Examine physiological and economic potential of new or non-commercial berry crops.**

ISSUE # 1 Develop sustainable crop production systems for berry crops in Ontario through breeding (long-term) and applied research (shorter-term) programs:
With the increasing costs of production and changing consumer attitudes, food safety, water quality and maintaining sustainable crop production systems are critical to the industry. Many of these are short-term goals and positive results can be developed in 4-5 years. That said, breeding new berry cultivars remains a long-term and on-going priority for the industry.

- Develop integrated weed control strategies for reduced pesticide use and crop losses in strawberries and raspberries.

  Research on weed control strategies in strawberries has been conduct at Ridgetown and Kemptville Colleges. This research should be coordinated to maximize its output. Problem weeds include horsetail, wood sorrel, field pansy, groundsel and broadleaf weed control in new plantings. Knowledge of the critical periods of weed control and a variety of weed control options, such as rotations, cover crops, planting patterns, fertility practices, tillage systems and herbicides, are needed to manage weed populations, reduce labor costs and reduce crop losses.

- Breed and select new strawberry and raspberry cultivars with improved quality, yield and pest resistance.

  The berry crop industry owes much of its success to new cultivars with improved yields and quality. This is particularly important as the industry moves away from PYO to fresh market berries. Cultivars are needed which produce high yields and good quality across the province. Strawberry and raspberry breeding programs are being conducted at Simcoe and Guelph with field selection and variety trials at Kemptville, New Liskeard and Ridgetown. The Ontario Coordinated Trials also has on-farm trials of new strawberry and raspberry cultivars across Ontario.

- Develop nutrient recommendations for macro- and micro-nutrients of berry crops under different production and irrigation systems. The first priority should be the efficient use of nitrogen and then phosphorous.

  Research to develop nutrient recommendations for strawberries has been started at Vineland. Current fertility recommendations in Ontario are based on research conducted many decades past. Since that time, cultivars and production practices have changed and yields have increased. This research should focus on recommendations for newer production systems and the various irrigation systems in use in the industry such as plasticulture, high density matted rows and trickle irrigation.

- Develop extended-season cropping systems for strawberries and raspberries including new varieties, plasticulture, dayneutrals, greenhouses, etc.

  Research on greenhouse raspberry crops is being conducted at Simcoe. New varieties will also help extend the cropping season in Ontario. Dayneutral strawberries and fall bearing raspberries are starting to extend our local berry season into the fall. Further extension of the growing season will increase Ontario's competitiveness and replace imports especially once methyl bromide is no longer available to the California industry.

- Develop integrated pest management options for strawberry and raspberry diseases and insect pests including the following on strawberries - anthracnose fruit rot, tarnished plant bug, 2-spotted spider mite, cyclamen mite, angular leaf spot, and root weevil, and the following on raspberries - cane diseases and fruit rots.

  The only research in Ontario on integrated pest management is being done on tarnished plant bug in Simcoe. These diseases and insects reduce the marketable yields of strawberries and raspberries and shorten the lifespan of plantings. Some such as anthracnose fruit rot in strawberries are relatively new to Ontario. This disease has already led to the withdrawal of a new strawberry cultivar which proved very susceptible to anthracnose. Others such as cyclamen mites and spider mites have been intermittent pests in the past but are becoming widespread and severe problems. As the industry diversifies into dayneutral strawberries and fall bearing raspberries control of some of these pest is much more challenging. For example, there is no insecticide for tarnished plant bugs in dayneutral strawberries.

- Develop virus detection methods and determine the incidence of virus diseases in strawberries and raspberries in Ontario.

  There is no research in Ontario on this issue. Since 1993, there has been very little research in Canada on viruses in berry crops. Ongoing research at AAFC in Summerland BC is focussed on engineering resistance to viruses. Research is required to develop rapid detection methods for strawberry palidosus, a virus-like disease, and to determine the reaction of Ontario cultivars to this disease. Research is also required to develop a rapid detection method for raspberry mosaic complex and to survey the incidence of the major virus components of virus decline of raspberries.

- Develop biological mite control strategies for raspberries.

  There is no research in Ontario on this issue. The suite of miticides is decreasing due to deregistration and pest resistance can occur if the same chemical controls are used continuously. Biological control represents a sustainable control measure that does not encourage pest resistance. As well, biological control would be very applicable in for the control of mites in fall bearing raspberry crops where miticide applications are not possible due to the harvest period.
- Determine economic thresholds for the control of foliar diseases of strawberries (ie leaf blight and powdery mildew).

  There is no research in Ontario on this issue. Economic thresholds will assist producers in controlling leaf diseases while reducing pesticide use.
- Develop effective, cost-efficient bird control strategies for blueberries.

  Bird problems in highbush blueberry production in Ontario seem to be getting worse every year. There are no effective, humane, environmentally sustainable and neighbour-friendly methods available to control this problem. There is no research in Canada on this issue.

ISSUE #2 Examine physiological and economic potential of new or non-commercial berry crops.

With consumer interest in nutraceuticals and functional foods, there is potential for expansion of new or non-commercial berry crops to help diversify the Ontario industry. There is very little work in this area being done in Canada.

Service Issues/Priorities

1. **Technology transfer of sustainable crop production systems for berry crops including integrated pest management, food safety and crop nutrition.** Sustainable berry production systems need to remain competitive, profitable and environmentally acceptable. Research and technology from around the world must be adapted to meet the needs of Ontario growers under Ontario conditions.

   Access to the unbiased expertise of extension personnel remains a critical issue. Two-way communication with growers and others in the berry industry through agriphones, newsletters, the internet, presentations, farm calls and individual contact is essential to transfer current technology and information.

2. **Maintain support of the berry crop propagation program including the SPUD Unit.** Although the OBGA manages the plant propagation program, University of Guelph researchers provide essential support to the program. Adam Dale and Becky Hughes continue to provide expert support to the Ontario plant propagation program and the ACHENE Committee. Micropropagated strawberry plants from the SPUD Unit in New Liskeard form the foundation of the strawberry plant propagation program. It is essential to the program that the SPUD Unit maintain and produce Nuclear stock.

3. **Rapid diagnostic disease service using DNA-based PCR techniques.** Techniques are becoming available for rapid diagnosis of crop diseases. It is essential to the crop industry that these techniques be available at a reasonable cost with a quick turn-around time. Coordination between all parties who will benefit from this type of service is necessary to move this technique from the research lab to the diagnostic lab.

4. **Minor-use pesticide registrations for berry crops.** Minor-use registrations are needed to maintain a competitive toolbox against pests in berry crops. Many registrations in berry crops are old and likely to be cancelled as US Food Quality Protection Act takes effect. While new products are being registered in Canada for crops with large acreages (ie field crops), there are few new registrations for high-value, low-acreage crops such as berries.

   A number of minor-use registration requests are in the system at present. These represent some of the highest priorities for the industry. However, they are not the only priorities. Time constraints on OMAFRA extension staff limit the number of registration requests in the system at any one time.

   The 2001-2002 Minor Use Registration priorities of this committee were submitted to the OHCRSC and the OPMRSC.

CRUCIFER CROPS

Minor Use Registrations

There exists a serious need for minor use pest control product registrations for improved control of insects, diseases and weeds of crucifer crops, especially specialty crucifers. In light of the effects of the US FQPA and continuing lack of a 'level playing field' for Ontario growers, the registration of new, 'reduced risk' and 'biopesticide' active ingredients as well as new seed treatments is also urgently needed. Increased cooperation with the US IR-4 program is strongly encouraged.

In addition the need for GLP certification of Univ. of Guelph, Ridgetown and AAFC field stations (Delhi, Vineland, St. Jean sur Richelieu) is required for future minor use residue trials.

Current Activities:

The University of Guelph, Simcoe Station and Muck crops Research station have recently undertaken GLP certification, however the costs to do this have been very high and the costs to maintain this put the certification in jeopardy. The University of Guelph, Laboratory Services has also indicated they will move in this direction. AAFC, Harrow has recently applied for GLP certification also. A researcher at AAFC, Agassiz, BC is also certified to conduct GLP trials. All of these are important steps, however major gaps remain.

The PMRA indicates that it has initiated programs to harmonize pest control product registrations such as joint review, the URMUR program and the biopesticides program, however at the grower level there is virtually no harmonization or sufficient access to new products.

Gaps/Barriers/Deficiencies:

The major barriers which impact the availability of minor use products are as follows:

- Excessive residue trials in crop zones 5 and 5B
- Lack of use of crop groupings for labeling of new products and minor use products
- The poor record of results for the URMUR program (only 6 products ever registered)
- The lack of access to products classified in the USA as 'reduced risk'
- The lack of access to products classified in the USA as 'biopesticides'
- The apparent lack of seed treatment harmonization
- The cost of conducting GLP residue trials
- The limited number of qualified personnel at a national level to coordinate minor use projects
- There are not enough GLP certified public institutions to carry out all of the necessary minor use priorities established annually.

See Recommendation 2 for further details.

1.Development of Pest Control Strategies

There is a need to investigate, develop and transfer practical pest control methods for cruciferous crops. Both established pests and new pests continue to plague crucifer crop growers everywhere. Access to effective IPM tools and strategies remains a barrier to competitive production in Ontario.

Current Activities:

There is some research activity underway by University of Guelph and Agriculture and Agri-Food Canada personnel on some of the established pests such as cabbage maggot, Lepidoptera, thrips, weeds, clubroot and soft rot as well as the new pests like swede midge.

Gaps/Barriers/Deficiencies:

There is a major effort needed in the area of developing IPM strategies for cabbage maggot on rutabagas. In addition there is a need for continued research into alternative management options for cabbage maggot on the entire crop group. The evaluation of plant species as trap crops for flea beetles, thrips, caterpillars and other insects, evaluation of varieties with resistance to pests, evaluation of biological and cultural control methods for the entire pest complex affecting crucifer crops is needed. The major diseases of current focus include black rot, clubroot, *Alternaria*, downy mildew and powdery mildew.

The two new pests effecting crucifers in Ontario that will require a long-term research commitment are swede midge and pea leafminer.

2.Nutrient Management

Because of concerns about current recommendations and impending legislation regarding nutrient management, the crucifer crops sector wishes to take a proactive approach to developing an integrated fertility program.

Current Activities:

Some limited work has been undertaken in the past few years to investigate the nutrient response of the major crucifer vegetables and to also relate this to nutrition's role in pest management programs. Most of this research is either completed or poorly funded.

Gaps/Barriers/Deficiencies:

A far more comprehensive and integrated fertility management program needs to be developed for crucifer crops which takes into account the complete soil nutrition regime and nutrient management planning. Studies on crop uptake, crop removal, growth stage models, the effects of irrigation and a review of current recommendations are needed.

Because soil-borne diseases (clubroot, *Rhizoctonia, Fusarium*) and some insect pests may be greatly affected by fertility practices, evaluation of disease and insect management strategies should be an integral part of any fertility research.

3.Specialty Crucifer Crops

The crucifer crops sector remains concerned that the continued introduction of new crucifer species from Asia could introduce new and devastating pests and diseases to Canada, threatening our traditional crucifer crops. There remains a need to continue to survey and detect these problems before they become epidemic.

Current Activities:

Other than limited and informal OMAFRA field activities, no research is currently being conducted in this area.

Gaps/Barriers/Deficiencies:

Because no research is being conducted the industry remains at risk from unknown introductions of diseases and pests as well as from a lack of management strategies for such new pests. The primary concern presently involves the introduction and spread of crucifer virus diseases.

4.Variety evaluation

There remains a need for the evaluation of crucifer crops varieties suited to the Ontario growing conditions, storage conditions, market demands, pest complex and fertility requirements.

Current Activities:

Other than some work by University of Guelph researchers in Kettleby and Simcoe, no major variety evaluations independent of seed companies is underway.

Gaps/Barriers/Deficiencies:

Because little or no work is planned for variety evaluations by public institutions, growers in Ontario and Canada generally will have less reliable information about suitable varieties to grow for various Ontario conditions. A more integrated approach to variety evaluations is also needed which takes into account differences in pest resistance and fertility requirements.

GINSENG

URMULE PRIORITIES:

1.To pursue the URMULE for Quadris or request another emergency exemption.
2.Seed treatments: Maxim, Ease-out, Dividend
3.Seed disinfectant: Chlorine, Vircon
4.Fungicides: BAS 500 (Cabrio), Actigard, Topaz, Quadris
5.Fumigants: C-100 (Chloropicrin)
6.Weeds: Gramoxone, broadleaf herbicide
7.Slug control: Safer's new product

RESEARCH PRIORITIES:

1.Identification and control of root and seed diseases and rusty root:

The Issue: Loss of quality and yield to root diseases continues to impact profitability. Cylindrocarpon and Rhizoctonia are the two root pathogens that consistently cause economic loss in ginseng. Neither fungus is adequately controlled chemically. Pythium causes seedling losses and currently has no registered control on ginseng. Fungicide residues in roots are being questioned in the marketplace and have been used as trade barriers. In addition to screening trials for efficacy of new, low risk compounds, there needs to be an evaluation of the impact of nutrition and site selection on the incidence and severity of these diseases. Everything possible needs to be done to reduce disease pressure. The incidence of rusty root in ginseng is increasing and effects of pathogens, environment and nutrients need to be evaluated.

Current Research Activities:

a) New and existing chemistries are being tested for efficacy against Rhizoctonia and/or Cylindrocarpon. (AAFC)
b) A field survey of Pythium tolerance to metalaxyl (AAFC)
c) The association of Cylindrocarpon and Rusty Root (AAFC)
d) A soil extraction method for detection of Cylindrocarpon (AAFC)
e) Investigations into the chemistry of rusty root development (U of G)

Current Extension Activities:

a) Weekly agriphone during the growing season that can be accessed on the internet, by phone, fax or email. Pictures of symptoms are provided and up to date control/prevention practices are discussed.
b) Growers with serious problems are visited and diagnosis confirmed
c) Grower trials comparing traditional use of Quintozene and Quadris for Rhizoctonia control were conducted
d) Cooperation with the OGGA to keep agribusiness and consultants aware of PMRA decisions
e) Technology transfer (U of G): Controlled temperature, above ground stratification of North American Ginseng seed. Hort Technology 11:100-103, 2001

Gaps and Barriers:

In addition to determining associated pathogens, more research is needed to evaluate the impact of nutrition and site selection on the development and severity of rusty root.

Pythium is increasing in seedling gardens. This may be in part due to climate change or may be a result of more ginseng being grown on land that has had had previous Pythium-susceptible crops or metalaxyl-resistant strains may be selected when the product is used for Phytophthora control. There is currently no product registered for use against Pythium in ginseng.

Diagnosis of seedling diseases is often not confirmed and many assumptions are made. This leads to misuse of fungicides and sometimes to the increase of Fusarium and Cylindrocarpon.

An effective seed treatment would reduce the disease pressure in seedling gardens. Seed treatments need to be evaluated using both traditional and above-ground stratification procedures.

Current research is a start in the right direction but needs to be expanded and continued if reduction in disease incidence is to be realized.

2.The Development of Production Protocols to address water use in ginseng as it relates to irrigation for cooling and to increase soil moisture; the use of nutrients in ginseng production to address nitrogen uptake and removal, the use of manure in the preplant year, the balance of macronutrients and use of micronutrients:

The Issue:

Recent hot summers have resulted in an increase in temperature under shade material used for ginseng production. These increased temperatures have resulted in aborted seeds. As more growers move away from the expense of wooden shade, where temperatures are lower, there is increasing use of low shade cloth, where temperatures are highest. Using irrigation to cool garden temperatures at the plant canopy level would alleviate the seed-set problem. Irrigation is also used to supply soil moisture. There is a precarious balance between enough soil moisture for optimum growth and too much soil moisture that promotes the development of Phytophthora root rot.

Ginseng gardens are planted after at least one year of field preparation. This traditionally includes the application of manure. Excessive manure application has been shown in Korea to induce rusty root symptoms. Nitrogen retention and leaching after manure application needs to be evaluated for optimum use of this practice. Recommendations for N use in ginseng vary widely as do recommendations for the macronutrients and micronutrients. There is no definitive study that has identified appropriate use levels. It is becoming increasingly evident that applications of high rates of nitrogen lead to disease problems.

Current research activities:

a) A basic nitrogen uptake study was recently completed at AAFC Delhi.
b) Ginseng has been included in a broad study of N and P use for nutrient management standards (OMAFRA)
c) Soil compaction and root shape trials (AAFC)
d) Ginseng irrigation trials (AAFC)

Extension activities:

a) There is no database of research on ginseng nutrition to use for recommendations. OMAFRA Extension activities have consisted of identifying the toxic response of ginseng to over-application if nutrients, particularly boron. Growers are reminded through the ginseng agriphone and magazine articles of the dangers of excesses in nutrient applications.
b) Technology transfer (U of G): Establishment of a ginseng crop from flower to seed to plant stand. Proc of the International Ginseng Workshop, Vancouver Nov., 2000
c) Technology transfer (U of G): The North American Inflorescence: development, the floret abscission zone and the effect of ethylene. Can. J. Bot. 79: 1048-1056, 2001
d) Technology transfer (U of G): Ginseng production issues for the 21st century. Proc. International ginseng conference, New York, 2001: 46-56.

Gaps and Barriers:

A basic study of nitrogen uptake, while it identifies the amount of N needed for growth and development, does not address optimum production levels for either quality or yield. Excessive use of manure in an effort to "improve" soil condition has led to incidents of rusty root. The use of manure, followed by fumigation leaves some gardens at high risk of rust damage. Protocols need to be developed for the use of manure that address the need for nutrients, soil tilth and organic matter and considers the effects of application on root quality.

Ginseng is a calciphile, in the wild it can contain up to 3,600 ppm Ca in the root tissue, and research is needed to identify those nutrients that are needed for optimum root quality and root size in cultivated gardens.

Growers are currently subjected to a variety of recommendations, few of which are based on sound research. There have been incidents of B toxicity causing economic loss as a result of recommendations that have no basis in research. Growers rely more on rumour than fact and there are few facts to counteract the rumours. Current recommendations used by accredited laboratories are based on carrot research.

Lack of suitable sites for ginseng production leads growers to use manure and nutrients to "fix" poor sites. As growers move to less suitable land, herbicide residues, pH problems and lack of basic soil nutrition become limiting factors in ginseng production.

3.Mar ket Development:

The issue: The Asian market is evolving and market needs are changing. As China moves in to the WTO, there are potential new opportunities for ginseng exported from Ontario. An understanding of current market trends will assist Ontario producers in addressing root quality needs.

Current research:

a) A proposal has been submitted jointly by the Canadian embassy in Beijing, AAFC and OMAFRA to examine current market trends and future potential in China.

Current Extension Activities:

a) Export Development personnel (OMAFRA) have worked closely with the OGGA to assess market needs and address changing export requirements.

Gaps and Barriers:
Requirements for additional root quality assurance will fall on growers and will add cost to production that may not be recoverable in the marketplace.

4.Clin ical research trials and associated production needs:

The Issue: In order to make claims on product sold in the North American market, clinical trial research must indicate efficacy and safety. These trials are lengthy and expensive. Whole root must be provided for use in such trials. In the future, extractable components may be used but they have not as yet been identified.

Current research activities:

a) The University of Toronto is conducting clinical trials on the affect of ginseng on diabetes. Preliminary trials have been encouraging and have indicated that ginseng does indeed have an affect on the symptoms of adult-onset diabetes.
b) Ontario ginseng producers have donated $40,000.00 of ginseng roots for this study.
c) A recently completed study (U of G) has examined the chemical properties of ginseng roots. Not yet published.

Current Extension Activities: none

Gaps and Barriers:
In order to be successful in the North American natural health product market, ginseng must be free of pesticide residue, microbial and other contamination. The Industry will need financial support to develop a HACCP based production system that specifically addresses these needs.
There is currently no means of eliminating residues and other contaminants from ginseng

roots. There may be an opportunity to evaluate the use of Supercritical Fluid Extraction to remove root contaminants to gain access to this market. A study needs to be done to determine not only the usefulness of this procedure but it's cost-effectiveness.

5.Germplasm research:

The issue: Little research has been compiled on ginseng strains that could be used for production. It has been shown in Korea that double-stems is a genetic trait and can result in approximately 40% in creased root weight. Strains have been selected in Korea that have disease resistance, red and yellow berries and chunky root shape. These are all traits that could have an impact on production in Ontario and improve growers profit margin.

Current research activities:
a) Ginseng Germplasm Project (AAFC)

Current Extension Activities:
a) Technology transfer (OMAFRA): The potential for strain selection in Ontario ginseng gardens: Tobacco Grower Magazine, 2001

Gaps and Barriers:
Many traits have been observed in commercial gardens and seeds for prospective strains have been collected. This is time-consuming work and many plants need to be screened to obtain desirable traits. It is the kind of work that initially lends itself to research station plots rather than grower plots. It is a commitment that does not seem to be there.

Ginseng is a slow-growing perennial with low fecundity. A traditional breeding program would require 15-20 years for selection of a stable trait that could be marketed to growers. Micropropagation of ginseng would enable this time span to be significantly shortened and sufficient plants to be made available to the industry to use commercially. Micropropagation research has identified the necessary components for selecting traits but transfer of explants to the field is low (about 3%). Research is required to bridge this gap and increase the success of field transfer.

GRAPE & WINE

Research Priorities (Issues)

(Note: Listed in order of Priority)

1. Development of Advanced Integrated Pest Management Tools

- Evaluate alternative pest control products (including conventional, biopesticides biological and pheromones) to replace organophosphate and carbamate insecticides, as well as, fungicides that may be lost as a result of FQPA and re-evaluation of pesticides **(see recommendation #2).**
- Conduct Good Laboratory Practices (GLP) residue trials to support minor use registration applications for pesticides **(see rec #3).**

- Support GLP and efficacy trials to support minor use herbicide applications for especially non-bearing but also bearing vineyards **(see recommendations 1-4).**
- Develop and validate predictive-risk management models e.g. grape berry moth and various diseases of grape **(see recommendation 1)**.
- Develop efficient and rapid monitoring methods for pests e.g. leafhoppers, mites, grape phylloxera and grape diseases **(see recommendation 1)**.
- Develop economic action thresholds for insect and mite pests **(see rec 1)**.
- Develop appropriate resistance management strategies especially for pests with rapid development of resistance eg. botrytis, powdery mildew, mites **(see rec 1)**.

2.Vineyard Management to Minimize Vine Stress and Maximize Productivity and Quality

- Soil amendments and crop nutrition.
- Research to support appropriate guidelines for Nutrient Management Plans (especially nitrogen and phosphorous).
- Training and other cultural practices to regulate vigour while maximizing productivity and fruit quality.
- Determine parameters and need for irrigation while assuring food quality assurance e.g. *E. coli* contamination in water.
- Application of precision agriculture e.g. GPS/GIS to support various disciplines and helping growers make better decisions.
- Mechanization of vineyard operations and reduce labour costs where possible.

3.Fruit Quality and Factors Affecting Wine Quality and Acceptance

- Marketing and consumer preferences.
- Aroma and flavour profiles as influenced by terroir, fermentation etc.
- Improved vintner methods for ice wine product.
- Yeast and bacterial metabolism in the fermentation and wine making process.
- Colour stability.

4.Variety, Clone and Rootstock Evaluation

- Vinifera grapes most important.
- Secondarily fresh market grapes.

Top 5 Insect and Mite Pests for Grape – 2001
(in order of priority)

1. Grape berry moth
2. Leafhopper species complex
   (including potato leafhopper, grape leafhoppers, 3-banded leafhopper)
3. European red mite
4. Erineum mite
5. Grape phylloxera

Top 5 Diseases for Grape – 2001

(in order of priority)

1. Powdery mildew
2. Botrytis bunch rot
3. Downy mildew
4. Phomopsis
5. Black rot

Other Pests Attacking Grape – 2001

1. Birds
2. Snails

MINOR USE PEST CONTROL PRODUCT REGISTRATION WISH LIST - ONTARIO

Sub-Committee: Ontario Grape and Wine Research and Services Submitted by: Gerry Walker and Leslie Huffman

Overall Rating	Target Pest(s)	Crop or Crop Group	Potential Solutions (active ingredient)	Potential Solutions (trade name)	Company	Registration Status*			Justification(s) for high ranking***									
						CDA	USA	IR-4**	1	2	3	4	5	6	7	8	9	Other
Example	*OBLR, leafhoppers, codling moth, plum curculio*	*Apples (Pome fruit)*	*kaolin clay*	*Surround*	*Engelhard*		*X*	*C*					*X*	*X*				
Entomology - Ontario																		
1	**Grape, 3 banded, and potato leafhoppers**	**Grape**	**imidacloprid**	**Admire**	**Bayer**		**X**				**X**	**X**		**X**	**X**			**Registered on grapes by Bayer in USA.**
2	**Grape berry moth**	**Grape**	**methoxyfenozide**	**Intrepid**	**Dow AgroSciences**		**X**	**?**			**X**	**X**		**X**	**X**			**Preliminary trials in Michigan look promising. IR4 Status not known.**
3	**Grape berry moth**	**Grape**	**pyriproxyfen**	**Esteem/Knack/ Distance**	**Valent Plant Products**		**X**	**P**			**X**	**X**		**X**	**X**			**Preliminary trials in Michigan look promising. IR4 Status not known.**
4	**Mites**	**Grape**	**abamectin**	**Agrimek**	**Syngenta**		**X**	**?**			**X**	**X**		**X**	**X**			**Currently registered on grapes in USA. Not sure if IR4 data was used to support registration.**
5	**Mites**	**Grape**	**bifenazate**	**Florimite**	**Uniroyal**		**X**	**?**			**X**	**X**		**X**	**X**			**Unsure of current registration and IR4 status in the USA.**

Plant Pathology Priorities																		
1	Powdery mildew Downy mildew Black rot	Grape	Kresoxim-methyl	Sovran	BASF	X	X					X		X	X	X		Company registration in USA. Emergency in Canada 2001 on grape. URMULE submitted Feb 2001.
2	Powdery mildew Downy mildew Black rot	Grape	pyraclostrobin	BAS 500	BASF							X		X	X	X		Joint review registration in progress. Status of grapes in submission unsure.
3	Powdery mildew	Grape	Monopotassium phosphate	Nutrol	?		X					X	X	X	X			Reduced risk and fast track in USA. Data availability and requirements unsure.
4	Powdery mildew Other diseases?	Grape	**Bacillus subtilis**	Serenade	?		X	?				X	X	X	X			Biopesticide.
5	Powdery mildew	Grape	trifloxystrobin	Flint	Bayer		X					X		X	X			Submitted by Bayer to EPA.
Overall Rating	Target Pest(s)	Crop or Crop Group	Potential Solutions (active ingredient)	Potential Solutions (trade name)	Company	**Registration Status***			Justification(s) for high ranking***									
						CDA	**USA**	**IR-4****	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Other**
Weed Science Priorities																		
1	Annual BLW and GRS Velvet leaf	New Vineyards	s-metolachlor dimethenamid metribuzin simazine + diuron linuron	Dual Magnum Frontier Sencor Princep + Karmex Lorox	Syngenta BASF Bayer Syngenta DuPont DuPont				X									
2	Annual Broadleaves: Lambsquarter, pigweed	Grapes (Fruiting Vineyards)	s-metolachlor dimethenamid metribuzin simazine + diuron linuron	Dual Magnum Frontier Sencor Princep + Karmex Lorox	Syngenta BASF Bayer Syngenta DuPont DuPont													

	Annual Grasses	Grapes	s-metolachlor dimethenamid sethoxydim fluazipfop-p-butyl quizalofop-p-butyl	Dual Magnum Frontier Poast Venture L Assure II	Syngenta BASF BASF Syngenta DuPont													
4	Perennial Weeds: Bindweed, Vetch, thistles	Grapes																
[illegible]																		
1	Fruit and Seedless	Fresh Market Grapes (only)	Gibberellic acid		Valent/Barlett s	X	X										X	Not registered on grape in Canada.
2	Powdery mildew	Grapes	Quinoxyfen	Quintec	Dow AgroSciences		X					X		X	X	X		Product has not been submitted in Canada by Dow AgroSciences.
3	Powdery mildew and Mites	Grapes	Aliphate petroleum distillate	Stylet Oil	JMS Flower Farms Inc.		X					X		X	X			Not sure how product received registration in USA.

* Registration status: Product/Active registered in Canada for another crop; Product and use registered in USA

** IR-4 Status: I = In progress
C = Completed and submitted to EPA
P = Proposed but not approved or started yet

*** Justifications:
10. No pest control product registered to control this pest
11. New introduced pest problem
12. Old technology replacement (organophosphate, carbamate, EBDC, etc)
13. Resistance management tool
14. Reduced risk, biopesticide or GRAS (generally regarded as safe) product
15. Supports a new IPM approach (pheromone mating disruption, etc.)
16. Export crop with need for harmonized pest control options and crop tolerances
17. More effective therefore leading to pesticide reduction
18. New crop

GREENHOUSE AND PROTECTED CROPS

Research Priorities (short and long term):

1. Evaluate new and old pest (thrips, whiteflies, lygus bugs, tomato bug), disease (powdery mildew, pythium, bacterial canker, Fusarium stem&root rot of cucumber), and virus (Pepino mosaic virus) control measures (including application methods) and implement IPM strategies for control of powdery mildew in cucumbers, tomatoes and peppers, Pythium root rot and Penicillium in cucumbers, and, Botrytis in all vegetables.

2. Develop and evaluate energy use and environmental strategies that optimize plant growth, productivity, and fruit quality, as well as integrated pest management techniques in greenhouse vegetables.

3. Development of strategies such as trap crops, insect exclusion via screening of vents, and new biological control agents, for improving control of new and old pests that disrupt IPM programs, such as thrips, lygus bugs, cucumber beetles, and whiteflies.

4. Maintain research on soilless culture with emphasis on recycling nutrient solutions and disease management to improve profitability and sustainability. Also, develop strategies to manage greenhouse waste (growing media, plant material, nutrient solution, plastic etc.) and to ensure the sustainability of the greenhouse industry.

5. Investigate the potential for the use of disinfectants such as chlorine bleach, Virkon, Physam 20, and the fungicide Phyton 27, as protectans against diseases, particularly bacterial and fungal diseases. Also, Identify sites and form of dormant stages of bacterial and fungal pathogens in order to effect rational control between crops with disinfectants and modification of cultural practices.

6. Evaluate new types of crops, cultivars, and post-harvest technology procedures (including packaging and labelling) to optimize yield and fruit quality.

7. Investigate strategies to reduce efficiency of insects as vectors of plant diseases such as CMV by aphids, Beet Pseudo Yellows Virus by whiteflies etc.

8. Test the efficacy of fungicides and disinfectants against such fungi as *Trichoderma harzianum, Verticillium fungicola, Mycogona perniciosa* and *Cladobotryum (Dactylium) dendroides.*

MUSHROOMS

Commercial mushrooms - **Long term priorities** (2 to 4 years duration)
The working group established the following as long term priorities:

Compost odour management
Improvement of mushroom quality
Influence of mushroom farming practices on surface and underground water
Development of disease resistant mushroom strains
Further studies in the use of biofilters
Indoor Phase I building designs
Management of Green mold and Verticillium diseases
Enhancement of value to mushrooms, e.g. nutriceuticals

Specialty mushrooms- **Long term priorities** (2 to 4 years duration)

1. Develop "best practices" procedures for packaging and storage of specialty mushrooms to improve the shelf life and quality at the retail store level.

Commercial mushrooms - **Short term priorities** (within two years)

Insect and Disease

Determine the effectiveness of fungicides, fungi static materials and barrier techniques to manage Trichoderma green mould on the casing and in the compost.
Provide the necessary information required by AAFC for registration of products already registered in the USA and Europe.
Develop biological control agents against mushroom diseases
Determine factors that contribute to an airborne Trichoderma green mould infection.
Determine post-crop temperatures and post-harvest management procedures necessary to eradicate a Trichoderma green mould infection.

Production

Determine the effect of water quality on mushrooms.
Develop criteria for the "best" casing soil, e.g. black peat, sugarbeet lime, flour lime.
Develop methods to achieve "whiter" mushrooms before or after harvest.
Pinpoint the most probable procedures or materials used during Phase I composting that produces offensive odors.
Determine influence of straw cultivars, poultry litter bedding, feed additives, ammonia suppressants and pesticide residues on composting, mushroom production and human health
Prepare a literature review of the nutritional benefit of mushrooms

Specialty mushrooms - **Short term priorities** (within two years)

Insects and diseases

Develop strains resistant to diseases

Production

Optimize environmental management techniques to maximize production and quality

Evaluation strains to optimize mushroom production and quality
Develop marketing strategies and retail presentations to improve profitability to mushroom growers

SERVICE PRIORITIES

Commercial mushrooms

Identification of insects, diseases and weed moulds
Compost odour analysis
The use of internet as means for providing technology transfer from own research and published work of others
Workshops

Specialty mushrooms

Identification of insects, diseases and weed moulds
Telephone consultations
Be an information centre on advances in specialty mushroom production
Deliver Trichoderma control information on Shiitake mushrooms
The use of internet as means for providing technology transfer from own research and published work of others
Production of training videos
Internet training courses
Workshops

Priorities for Minor Use Registrations:

Table 1. Overall Crop Pest Rating - Greenhouse Vegetables

Overall Priority Rating	Pest	Crop	Reasons
1	Powdery Mildew	Cucumber	Resistance appears to have developed
		Pepper	New disease in pepper, only 1 product registered
2	Botrytis	Tomato	Resistance appears to have developed to current product, can cause significant losses (13% yield loss reported in 2000 in one crop.
		Cucumber	Resistance appears to have developed to current product
3	Root diseases	Cucumber	Significant losses can occur Only 1 product registered for Pythium
		Tomato & Pepper	No products registered
4	Thrips	Cucumber, Tomato, Pepper	No products registered, Lannate for Cukes not on current label New thrips problem – Echinothrips – threatens cukes & pepper
5	Whitefly	Tomato,	IPM-compatible products needed, none currently registered for use during crop
		Cucumber	Vector Beet Pseudo Yellows in cukes Resistance exist to current products IPM-compatible products needed, none currently registered for use during crop
6	*Lygus bugs	Cucumber	No products currently registered for its control IPM-compatible products needed
		Pepper	IPM-compatible products needed
7	*Cucumber beetles	Cucumber	No products currently registered for its control IPM-compatible products needed
8	*Fusarium solani*	Cucumber	New disease No products currently registered for its control
9	Two-spotted spider mite	Cucumber, Tomato, Pepper	Resistance appears to have developed to current products IPM-compatible products needed
10	Aphids	Cucumber, Tomato, Pepper	IPM-compatible products needed Vector viruses in all crops

* These pests are particularly important because of the disruption they cause in biological control programs.

Table 1a. Overall Crop Pest Rating - Mushrooms

Overall Priority Rating	Pest	Crop	Reasons
1	Green mould disease - *Trichoderma harzianum* (biotype Th4)	Commercial mushrooms	75% of Ontario's farms with infection histories. Significant losses occur. Accumulative dollar losses in millions. Controlled principally by sanitation and hygiene. Easily vectored by humans and insects. Coating of spawn grain with benomyl helps; resistance developing in USA. No fungicide effective once infection starts.
2	Dry bubble disease (*Verticillium fungicola*)	Commercial mushrooms	All Ontario farms with infection histories. Easily vectored by humans and insects. Resistance to benomyl. Products with zineb not exportable to USA. Chlorothalonil, marginal control, phytotoxic to mushroom mycelia.
3	Trichoderma spp	Commercial Mushrooms Specialty Mushrooms	Spotting of mushroom caps, reducing quality. No fungicide registered during production. A common contaminant of oyster and shiitake substrate. No fungicide permitted. Losses frequently high.
4	Bacterial blotch	Commercial and Specialty Mushrooms	Spots and decay of tissue. Controlled principally by environmental management. Chlorine lowers population density.
5	Sciarid fly: (*Lycoriella mali*)	Commercial and specialty mushrooms	Direct damage by larvae; adults as significant vector for diseases.
6	Cobweb disease (*Cladobotrium dendroides*)	Commercial mushrooms	Infrequent occurrence in Canada. Highly resistant strain in Europe.

Minor Use Pesticide Registration Wish List for GREENHOUSE AND PROTECTED C ROPS

Overall Rating	Chemical Name	Brand Name	Company	Crop		Registration Status			Justification								
						CDN	USA	IR4	1	2	3	4	5	6	7	8	Other
Example	imadacloprid	Admire	Bayer	Grape	Grape and potato leafhoppers	4	4	C	X			X		X	X	X	New varieties planted more susceptible.
Insecticides and Acaricides																	
1	spinosad	Conserve	Dow	Tom (T) Cuke (C) Pepper (P)	Thrips, Caterpillars	X	X									X	Only Nicotine registered for thrips, not very effective, practical & economical
2	pyriproxyfen	Distance	Valent	T, C, P	whiteflies		X								X		No IPM compatible product for whiteflies – only soap – causes flower damage
3	bifenazate	Floramite	Crompton's	T, C, P	Spider Mites										X		
4	acetamiprid	Assail		T, C, P	Mirid bugs				X	X							
5	pymetrozine	Endeavour	Syngenta	T, C, P	Aphids, psyllids, maybe mirids				X	X					X		
6	azadirachtin	Aza-Direct	Gowan	T, C, P	General pests										X		
Fungicides																	
1	kresoxim-methyl	Sovran		T, C, P	mildew								X				
2	fenhexamid	Decree		T, C, P	botrytis								X				
3	metalaxyl	Ridomil Gold	Syngenta	C	pythium								X			X	
4	propamocarb	Previcur		T, P	pythium				X								
5	fludioxinil	Medallion		T, C, P	Fusarium				X								
6	paraffinic oil	Stylet Oil	JMS Stylet Oil	T, C, P	mildew								X		X		

Justification Reasons:
No pesticide registered to control this pest.
New introduced pest problem
New crop.
EBDC fungicide replacement or OP insecticide replacement.
Resistance management tool
More effective therefore pesticide reduction.
Reduce risk product or support new IPM approach ie. Predictive models, pheromone control program
Export crop: need to harmonize pest control options or establish a crop tolerance.
Registration Status: IR 4 Codes: I means In-Progress; C- completed and submitted to EPA; P means proposed but not approved or started yet.

LOW ACREAGE & SPECIAL CROPS

1.NUTRIENT MANAGEMENT INFORMATION GAPS AND PLAN IMPLEMENTATION COSTS:

The Issue: Nutrient management legislation is in the process of moving forward, sooner than later. Growers and industry personnel associated with production and processing of Low Acreage and Special Crops indicate a shortage of reliable and current information available on which to base fertility recommendations. Furthermore the agri-business community has expressed concern over the shortage of human resources dedicated to implementation of nutrient management planning for Low Acreage and Special Crops. The dollar cost to the grower and industry associated with implementation of nutrient management planning is a concern. Can the industry remain competitive with imports from countries that grow similar produce without regard for nutrient management. Will the Ontario grower be able to compete in future market without financial assistance?

Current Research/Extension Activities

Very limited to nil research is being conducted in Ontario or Canada with respect to nutrient management recommendations for Low Acreage and Special Crops. Technology transfer specialists (extension) within Crop Technology, OMAFRA have commenced an evaluation of recommended fertility rates and nutrient crop removal rate for certain Low Acreage and Special crops.

Gaps/Barriers

Agronomic research with respect to all aspects of nutrient management planning criteria for all Low Acreage and Special Crops requires completion. The criteria for soil nutrient deficiencies, pH, different soils, nutrient removal rates, for respective yields of those crops considered Low Acreage and Special must be developed as soon as possible at a reasonable cost to the agri-business community.

2.POST HARVEST STRATEGIES TO ENSURE FOOD SAFETY

The Issue: Grocery chain store retailers and agriculture industry processors indicate need for HACCP certification or equivalent from grower to consumer. The market is expressing concern over the exceeding of chemical residues, wash water quality, worker hygiene. Growers of Low Acreage and Special Crops have expressed concern over the added cost of record keeping, grower liability insurance and the ability to compete in the market place with imported produce from countries that they do not enforce post harvest quality food safety standards.

Current Research/Extension Activities

Both federal and provincial governments continue to address the food safety issue. Federally such a mandate is addressed through the CFIA, PMRA, Health Canada and Agriculture and Agri-Food Canada. Provincially a fresh market quality Program Lead Position within Crop Technology, OMAFRA has been set in place. In addition, all crop technology specialists working in the area of Low Acreage and Special Crops extension do appreciate the need for improved post harvest, strategies to ensure food safety and quality.

Gaps/Barriers:

The Low Acreage and Special Crops fresh market and processing sectors could benefit from increased human resources and financial assistance towards implementation of food safety programs. Although some industry players have taken a pro-active approach to the implementation of HACCP, others have not.

3.MINOR USE LIMITATIONS

The Issue: The agri-business community associated with production, processing, research and extension in Low Acreage and Special Crops has expressed concern over inconsistencies and unreasonable time requirements for pesticides to become available for Ontario producers. PMRA has instituted limits to minor use submissions; therefore the PMRA must accept crop group labels and harmonize crop mapping with the USA. A pro-active and stream lined process perhaps "an office of Canadian minor use" is desperately required to facilitate registration and trials.

Current Research/Extension Activities:

The federal PMRA is generally responsible for processing of minor use registration. Provincially, Crop Technology, OMAFRA staff makes production recommendations in keeping with minor use permits. The agricultural industry relies on the University of Guelph as well as Agriculture and Agri-Food Canada to conduct (GLP) compliant trials.

Gaps/Barriers

In order to remain competitive with imported agricultural products the Minor Use process must be pro-active and streamlined. The industry requires a significant injection of funding support for minor use data collection. If the PMRA were to accept crop group labels and more harmonization with the USA, the minor use registration process would improve.

4.GOO D LAB PRACTICE (GLP) COMPLIANCE

The Issue: Commencing 2001, all pesticide residue trials must be conducted as GLP compliant. A significant number of minor use projects are required and planned for Low Acreage and Special Crops. A limited number of field research station sites are GLP compliant or in the process of becoming GLP compliant. In the past minor uses have been delayed by funding problems, shortage of sponsorship and extensive PMRA demands. Such delays place Ontario growers at a disadvantage. Therefore, it is imperative to support additional field research sites to become GLP compliant as soon as possible.

Current Research/Extension Activities

Personnel and facilities at University of Guelph, Muck Crops and Simcoe Research Stations, received GLP certification in 2001 and Lab Services Division are pursuing GLP certification. Provincially, Crop Technology, OMAFRA staff continues to sponsor minor use projects and pushes for additional field station sites to become GLP certified.

Gaps/Barriers

Very minimal if my action has been taken by AAFC research centres to obtain GLP certification. It is important that additional University of Guelph sites (Ridgetown) and Agriculture and Agri Food Canada Sites (Delhi, Vineland, St. Jean sur Richelieu) move to certify staff and field station sites as GLP compliant as soon as possible.

5.ACCEPTANCE OF GENETICALLY MODIFIED ORGANISMS (GMO)

The Issue: A select but limited number of Low Acreage and Special Crops (e.g. Sugar beets) could potentially benefit from continued research and acceptance of GMO varieties. This is important to the grower/processor to ensure yield and quality and to remain competitive and in the market place with their USA counterparts.

Current Research/Extension Activities

Very little if any research is taking place with respect to GMO development of Low Acreage and Special Crops in Ontario. Information with respect to GMO variety development is left to private research seed companies primarily located in the USA. Extension activities in this area too are rather limited however supported in principle by OMAFRA Crop Technology specialists providing the market exists for GMO products.

Gaps/Barriers

Consumer demand for GMO products in some countries has diminished. Market opportunity has been lost. For Ontario producers to remain competitive with USA counter parts, it is important to recognize the advantages of GMO varieties.

URMULE PRIORITIES

The Sub Committee reviewed the current, proposed and completed minor use submissions for Low Acreage and Special Crops as compiled by Minor Use Coordinator, Jim Chaput, OMAFRA. Issues discussed included crop zones, use of crop groupings, the IR4 program, URMUR program and accessibility to reduced risk, biopesticide and seed treatment products. Several URMULE projects are on hold due to the PMRA review of organophosphate insecticides. The committee reviewed the current minor use needs list and support the following with guidance of J. Chaput.

PEPPERS: - continue support of clomazone (Command) as weed control for Peppers

CUCURBITS:- initiate support of quinoxyfenl/Arius as powdery mildew control for cucurbits
- initiate support of bifenazate, Floramite as a mite control for cucurbits
- initiate support of s-metolachlor/Dual Magnum as weed control for cucurbits
- continue to support imidacloprid (Gaucho) as cucumber beetle control for cucurbits
- continue to support quizalofop-p-ethyl (Assure II) as grass control for cucurbits
- continue to support clomazone (Command) as weed control for cucurbits
- sethoxydim (Poast) registered as grass control for cucurbits

ASPARAGUS:
- propiconzole (Tilt) registered as fungicide for asparagus
- continue to support spinosad (Success) as asparagus beetle and cutworm control for asparagus
- initiate support of pymetrozine (Fulfill) as aphid and tarnish plant bug control for asparagus
- continue to support tebuconazole (Folicur) as rust control for asparagus
- initiate support of trifloxystrobin or BAS 500 as rust control for asparagus
- continue to support linueron (Lorox) as early emerging weed control for asparagus
- continue to support rimsuluron as weed control for asparagus
- continue to support azoxystrobin (Quadris) as rust control for asparagus
- initiate support halosulfuron/pyridate as late season grass control for asparagus
- initiate support of flumioxazin/suflentrazone as control of resistant weeds for asparagus

SNAP & LIMA BEANS:
- initiate support of zoxamide (Gavel) as disease control for beans
- continue to support tebuconazole (Folicur) as rust control for beans
- continue to support cyhalothrin-lambda (Matador) as stinkbug control for beans

CHICORY:
- initiate support of kerb (band applied) as grass control for chicory
- continue to support benefin (Balan) as a weed control for chicory
- continue to support quizalofop-p-ethyl (Assure II) as grass control for chicory
- continue to support azoxystrobin (Quadris) as disease control for chicory
- continue to support trifusulfuron-methyl (Up beet) as weed control for chicory

SUGAR BEET:
- continue to support tetraconazole (Einent) as leaf blight control for sugar beets
- continue to support tebuconazole (Folicur) as leaf blight control for sugar beets
- continue to support desmedipham + clopyralid + trifusulfuron methyl + quizalofop-ethyl (4 way microrates) as weed control for sugar beets
- continue to support s-metolachlor (Dual-Magnum) as weed control for sugar beets
- continue to support (IR-4 project #07998) myclobutanil (Nova) as powdery mildew control for sugar beets

EGGPLANT:
- continue to support pyridaben (Pyramite) as mite control for egg plant

- continue to support imidacloprid/Admire as Colorado potato beetle control for egg plant

SWEET POTATO:

- continue to support clomazone (Command) as weed control for sweet potatoes
- continue to support naproamide (Devrinol as weed control for sweet potatoes

HERBS:

- initiate support of topaz as septorial blight control for parsley and cilantro
- initiate support of cyhalothrin-lambda (Matador) as two-spotted spider mite control for parsley and cilantro

NURSERY/LANDSCAPE & TURFGRASS

1. Development and publication of nutrient management guidelines (Research)
2. Development of alternatives to pesticides (Research)
3. Dealing with water quality and quantity problems (Research)
4. Biology and control of emerging pests (Research)
5. Response to the plum pox virus problem (Service)
6. Acquisition of pesticide use data (industry and public) (Service)
7. Coordination of matching research needs, funding, and researchers (Service)
8. Acquisition of current industry economic data (Service)
9. Dealing with a chronic labour shortage (Service)
10. Educating the regulators (Service)

POTATO

1. Potato Productivity: Nutrient Management, Irrigation and Soil Improvement
2. Control of Soil and Seed Borne Diseases
3. Evaluation of New Varieties for the Ontario Market
4. Post Harvest Research
5. Integrated Pest Management and Insecticide Resistance Monitoring
6. Greenhouse Minituber Production at the Spud Unit

Research Priority # 1

Potato Productivity: Nutrient Management, Soil Improvement and Irrigation.
Growers must consider many factors to produce a high quality crop. Fertility, soil tilth and water availability are the most important factors that influence crop productivity. Ontario potato growers must achieve high yields of high quality tubers to remain competitive.

Proposed legislation on nutrient management and the reduced water for irrigation are issues that need to be addressed.
For the past 10 years, no potato research addressing nutrient management, soil improvement or irrigation has been conducted in Ontario either by the University of Guelph or by AAFC.

Growers need to know the optimal fertility levels for new varieties entering the marketplace.

Growers also need long-term trials to determine the effect of crop rotation, drainage and cultivation on soil tilth and potato production.

Research on irrigation such as drip irrigation and irrigation scheduling would help conserve water.

Research Priority # 2

Control of Soil and Seed-Borne Diseases.

Every year, potatoes are affected by soil and seed-borne diseases that reduce yields or make the crop unmarketable. Fusarium, Rhizoctonia, scab, early dying (Verticillium wilt and nematodes), late blight, early blight, pink rot, leak and soft rot are among the most important diseases attacking the potato crop in Ontario.
There is only one plant pathologist in Ontario conducting research on the control of soil-borne diseases, Dr G. Lazarovits at AAFC, London. Dr. Lazarovits is evaluating the use of organic amendments to reduce scab. His lab has also developed a laboratory method to predict the level of scab infestation in fields from soil samples. This research should continue.
OMAFRA has evaluated the use of new low-risk fungicides to control Rhizoctonia black scurf, a disease that makes tuber unmarketable. Research on new control methods should be investigated
The Potato Board has supported surveys conducted by Dr H. Platt from AAFC in Charlottetown to identify the late blight strains that have been found in Ontario. Such studies provide an early warning of changes in races which may affect control methods.

Research Priority # 3

Evaluation of New Varieties for the Ontario Market.

To remain competitive, potato growers must grow varieties that meet consumers' demands. Testing under Ontario conditions is crucial for the selection of new varieties that the provincial market requires.
These varieties also need to be evaluated for their tolerance to disease and physiological disorders, their dry-matter content, yield and performance under adverse growing conditions. Testing is being conducted by the Potato Board Co–operative Variety Trials, the University of Guelph and OMAFRA. New varieties evaluated in these trials have been adopted and are being grown successfully by Ontario growers.

This type of research is invaluable for potato growers and should continue as new varieties with improved traits would allow them to expand markets and reduce inputs of pesticides and fertilizers.

For instance, Superior, the most common early variety, does not perform well under dry conditions. It requires weekly irrigation. Superior is also very susceptible to nematodes and Verticillium wilt. Chieftain, the main red skinned variety grown in the province, is susceptible to heat necrosis. In addition the red skin color of this variety fades in storage and turns brownish.

Ontario growers have indicated that variety testing is extremely important and should continue.

Research Priority # 4

Post-harvest physiology. The potato-chip market is very competitive, and processors require high quality potatoes to satisfy consumers' demands. One of the main problems growers and processors face is the formation of reducing sugars in tubers induced by low temperature storage. Reducing sugars cause the darkening of potato chips when fried. Also, specific gravity or dry matter content is an important factor in process quality.

The University of Guelph has conducted research to identify factors regulating process quality in potatoes, to elucidate the mechanism of low temperature sweetening in potatoes and to develop models for prediction of end-product color from harvested and stored potatoes.

Further research is needed to allow growers to better manage the crop in storage and to suppress the formation of reducing sugars in tubers which lead to dark chip color.

Research Priority # 5

Integrated pest management and insecticide resistance

Potato insects and diseases are a constant threat to the potato crop.

The Colorado potato beetle (CPB) is one of the most serious pests in the province. If left uncontrolled and weather conditions are favorable, beetles can devastate a field in a few weeks. Colorado Potato beetle populations have developed resistance to most of the insecticides used for their control. Admire is the only insecticide currently registered in Ontario that is effective against all CPB stages.

In 2001, a provincial survey by AAFC did not detect resistance to Admire in CPB populations in the main production areas of the province. Monitoring for the development of resistance to Admire is extremely important to alert growers and should continue. The testing and registration of new insecticides with different modes of action would reduce the likelihood of resistance developing.

Aphids can cause serious economic losses if present in fields. They also spread virus diseases. Aphids have developed resistance to insecticides in other potato production areas. Monitoring aphid insecticide resistance in Ontario is important before problems develop.

Wireworms are a problem in potato fields rotated with hay, a desirable practice because rotation reduces soil-borne diseases and improves yield. There are, however, no reliable procedures to determine the extent of wireworm infestations nor are there effective products for wireworm control.

The management of potato insects and insecticide resistance monitoring are ongoing issues. Research into alternative methods of pest control needs to be addressed.

Research Priority # 6

Greenhouse Minituber Production for Seed Potatoes

The Ontario seed potato industry is based on Nuclear minitubers produced by the Seed Potato Upgrading and Distribution (SPUD) Unit and the contract greenhouses in northern Ontario. Research to improve greenhouse yields and minituber size, and to minimize the risks associated with Nuclear seed production, benefits seed potato producers by reducing the cost and increasing returns in the field while maintaining the highest quality possible.

Research is also required to further develop rapid multiplication and production systems for transgenic clones which produce recombinant proteins. Molecular farming of these Industrial tubers offers the Ontario industry a chance to diversify into a high-value crop producing proteins for many industrial applications. The OSPGA, MPB Cologne and the Ontario Potato Board have received Healthy Futures funding for this project.

Current research to improve Nuclear minituber production and further develop rapid multiplication systems for Industrial Tubers being conducted at the SPUD Unit is addressing this issue.

Service Priorities

1. Registration of Quadris to control Early Blight, Actara to control Colorado Potato beetle and leafhoppers, Spinosad to control Colorado Potato beetle, Fulfill to control aphids and Fipronil to control wireworms
2. Maintain Tissue Culture Production for the Seed Potato Program at the SPUD Unit. The SPUD Unit is the foundation of the Ontario Seed Potato Program supplying producers with high quality Nuclear minitubers. This service is essential to the industry.

ROOT, BULB AND LEAFY VEGETABLES

MINOR USE PRIORITIEs

The committee reviewed new minor use needs and ranked them for each commodity, as shown below:

Dry Onions

1.	Tebuconazole	White rot, Onion smut
2.	Dimethenamid	Weeds
3.	Fipronil	Onion Maggot
4.	Spinosad	Thrips

5. Zoxamide	Downy Mildew
6. Ethofumesate	Weeds
7. Fluroxypyr	Weeds
8. Pymetrozine	Thrips
9. Pyriproxyfen	Thrips

Green Bunching Onions

1. Chlorthaldimethyl	Weeds
2. Fipronil	Onion Maggot

Garlic

1. Tebuconazole (seed treatment)	Fusarium

Carrots

1. Fluazinam	Sclerotinia
2. BAS 516	Leaf blights
Tebuconazole	Leaf blights
BAS 510	Leaf blights

Lettuce

1. Acibenzolar	Bacterial leaf spot
2. Zoxamide	Downy Mildew
3. Fluazinam	Sclerotinia, bottom rots
4. Pymetrozine	Aphids
5. BAS 516	Downy Mildew

Celery

1. Spinosad	Leafminer
2. Azadirachtin	Leafminer
3. Pyraclostrobin	Leaf blight
4. BAS 510	Leaf blight

Spinach

1. Fosetyl-al	Downy Mildew
2. Mefenoxam	Downy Mildew
3. Zoxamide	Downy Mildew
4. Pyraclostrobin	Foliar diseases

RESEARCH & SERVICES PRIORITIES

Seven research issues were identified and prioritized in the following order:

1. Minor Use Pesticide Registrations
2. Crop Fertility Issues.
3. Disease Management
4. Integrated Insect and Nematode Management.
5. Development of Integrated Weed Management Programs.
6. Value-added Product Development.
7. Cultivar Evaluations.

Details of each Research Issue are given below.

Issue # 1: Minor Use Pesticide Registrations

The Issue:

The impacts of FQPA (USA) and re-evaluation (Canada) decisions are very great for Canadian growers because of a lack of access to alternative replacement products. The registration of new, 'reduced risk' active ingredients is urgently needed.

Due to the loss, or anticipated loss, of current pesticide products, there is a need for minor use pesticide registrations for improved control of insects, diseases and weeds. Increased demands from PMRA for multiple location efficacy and residue trials have greatly reduced the feasibility of obtaining many minor use registrations.

Current Research/Extension Activities:

- Research towards the registration of minor use pesticides has been an ongoing concern of many researchers involved in this committee for many years.

Gaps/Barriers/Deficiencies:

- Seek minor use pesticide registrations for improved control of insects, diseases and weeds of muck crops.
- There is a particular need for minor use research on herbicides and insecticides for green bunching onions, and for new products to control herbicide-resistant weeds.

- The GLP certification of Univ. of Guelph (Ridgetown) and AAFC (Vineland, Delhi) field stations is also required for future minor use residue trials for insecticides and fungicides, in addition to herbicides.
- Increased cooperation with the U.S. IR-4 program is strongly encouraged.

Issue # 2: Crop Fertility Issues

The Issue:

A. **Fertility Recommendations.** In light of impending provincial nutrient management legislation, research is required to review and revise current information and provincial recommendations for root, bulb & leafy vegetable crops. Only limited research specific to root, bulb & leafy vegetables has been undertaken, so the accuracy and suitability of current recommendations to these crops is unknown.

B. **Micronutrient and Tissue Analysis Recommendations.** Increasing attention is being placed on the use of micronutrients in crop production. However, for many of the micronutrients in question, there is a lack of sufficient research to either support or counter their use. The feasibility/accuracy/validity (?) of the use of tissue analyses in making micronutrient recommendations must be evaluated.

Current Research/Extension Activities:

- Research on nitrogen management of carrots, onion and cabbage has been undertaken by Drs. M.R. McDonald, A. McKeown and C. Scott-Dupree (Departments of Plant Agriculture and Environmental Biology, University of Guelph) over the last 2 years. This research has largely focused on application rates and timing and the effects of nitrogen on insects and diseases.
- C. Kessel and K. Callow began micronutrient studies on cole crops and Asian crucifers in 2001; however there is no plan to extend these trials to root, bulb & leaf vegetable crops.

Gaps/Barriers/Deficiencies:

A) Fertility Recommendations. Special emphasis should be placed on an integrated fertility program which takes into account the complete soil nutrition regime and nutrient management planning; validation of crop uptake, crop removal, and growth stage models specific to root, bulb & leafy vegetable crops are required as well as a revision of current Provincial recommendations.
Of particular concern is the applicability and accuracy of current nutrient parameters in assessing nutrient input/output of vegetable production practices on muck soils.

B) Micronutrient and Tissue Analysis Recommendations. Improvements in fertilizer recommendations for root, bulb and leafy vegetable crops with particular emphasis on in-field evaluation of new micronutrient formulations and the use of tissue analysis. The evaluation of commercially available micronutrient formulations for solubility and availability of micronutrients to plants is needed in order to permit accurate recommendations to be made to growers.

Issue # 3: Disease Management

The Issue:

The presence of diseases in field and in storage greatly impacts the quality of vegetable produce, and causes serious post-harvest losses of stored produce. Certain diseases such as *Sclerotinia* and *Sclerotium* are no longer adequately prevented by existing fungicides and the incidence of some diseases such as downy mildew on onions has been increasing in recent years.

Current Research/Extension Activities:

- Research on *Sclerotinia* of carrots has been undertaken by Drs. G. Boland and M.R. McDonald over the last 3 years. This research has largely focussed on the biology and epidemiology of *Sclerotinia sclerotiorum*, but includes a component on cultural control practices.
- Research on the control of disease in storage is also being addressed. This research is largely focussed on determining if the wooden boxes are an infection source for stored carrots.
- Research on *Sclerotium* of onions has been undertaken by Drs. T. Hsiang and M.R. McDonald over the last 2 years. This research has focused on the use of Vesicular Arbuscular Mycorrhizae (VAM) as a biological control of *Sclerotium cepivorum*
- There is some research on biological controls for *Sclerotinia* on lettuce being initiated at MCRS.

Gaps/Barriers/Deficiencies:

Effective management practices are needed for foliar and soil-borne diseases of all root, bulb and leafy vegetable crops, with particular emphasis on *Sclerotinia,Pythium, Sc lerotium,Fusarium* , and *Rhizoctonia* spp.: leaf blight, early and late blight, corky root rot, bacterial leaf spot, downy mildew, white rot, violet root rot, crown rot and crater rot. Approaches may include cultivar resistance, fungicides, biological controls, and soil amendments, among others. Information on the biology and epidemiology of these diseases is also needed.

Issue # 4: Integrated Insect and Nematode Management.

The Issue:

Effective management of insect pests is complicated by the anticipated loss of older pesticides, by reduced efficacy of existing pesticides, by lack of access to new pesticides, and by the presence of several new insect pests in Ontario vegetable crops. In addition, effective management practices for nematode pests of vegetable crops have not been defined.

Current Research/Extension Activities:

- Pea leafminer research was begun by Dr. R.H. Hallett, University of Guelph, in 2000. This research is focussing on: whether pea leafminer can overwinter in Ontario field conditions; the host range of the Bradford pea leafminer population; protocols to improve sticky trap monitoring of populations; and insecticide evaluations. A factsheet for growers on leafminers of vegetable crops was prepared by Jim Chaput in 2000.
- There are no active research projects on tarnished plant bug, aphids or cutworms.
- Drs C. Scott-Dupree and M.R. McDonald have recently completed a project on the interactions between onion maggots and onion smut, including implications for control recommendations.
- Drs. C. Scott-Dupree and J. Tolman are currently investigating the presence of insecticide resistant onion thrips populations in the Thedford-Grand Bend region.
- Nematode research being conducted in Ontario, does not focus on crops of concern to this committee. With the retirement of Dr. J. Potter in 2002, the future of nematode research capabilities in Ontario is in jeopardy

Gaps/Barriers/Deficiencies:

An integrated crop management or systems approach is needed to ensure the successful implementations and adoption of new management practices developed for both insect and nematode pests of root, bulb & leafy vegetable crops. IPM is a systems approach; control of one pest element can influence the balance of others within the system. Therefore, the development and evaluation of sustainable IPM programs to address the dynamic arthropod pest complexes (insects, mites) of vegetable crops is required.

Insect Pests. Development of appropriate management practices including, but not limited to, cultivar resistance and alternatives to pesticides, must be developed for control of insect pests. Existing research programs must be expanded and supported over the long-term in order to permit the development of effective management programs and specific control recommendations for these insect pests.

Special consideration should be give to:

1. control and population dynamics of major pests (including, but not limited to, onion maggot, onion thrips, carrot rust fly, pea leafminer);
2. secondary pest resurgence and control (including, but not limited to, carrot weevil, tarnished plant bug, aphids, cutworms);
3. new pest introductions and/or developments (including, but not limited to, pea leafminer, leek moth; and Provincial surveys for new pests, including pea leafminer in multiple crops and leek moth in onions and garlic);
4. evaluation of new pest control products;
5. biological control agents and cultural techniques;
6. economics of program implementation.

Nematode Pests. Integrated nematode management systems are required for carrots and other root, bulb & leafy vegetable crops, including methods such as crop rotations, soil amendments, band fumigation and late fall plowing. Damage thresholds and symptom expressions for species such as lesion and pin nematodes should also be considered.

Issue # 5: Development of Integrated Weed Management Programs.

The Issue:

The control of weeds, and the increase in resistant weed populations, is an ongoing challenge for growers of root, bulb & leafy vegetable crops. Weeds of particular concern to this group are yellow nutsedge, common groundsel and grasses. In recent years an increase in resistant weeds (e.g. pigweed) has been observed.

Current Research/Extension Activities:

- A number of weed-related research projects have been undertaken at the University of Guelph (Yellow nutsedge - Dr. Francois Tardif; weeds in no-till carrots and onion - Dr. Clarence Swanton), but these have received little or no funding and their future is uncertain.
- Dr. F. Tardif has been investigating examples of weed resistance on an unfunded basis, but the root, bulb & leafy vegetable sector cannot rely on the long-term continuation of this service.
- Dr. Diane Benoit (AAFC, HRDC- St Jean-sur-Richelieu) has collaborated on yellow nutsedge research with Dr. F. Tardif, but the current status of her research program is unknown.

Gaps/Barriers/Deficiencies:

Research is needed to investigate: cultural practices, new pre- and post-emergence herbicides, herbicide banding, new weed introductions and changes in the weed complex. The weeds of special concern are yellow nutsedge, common groundsel and grasses. Practical short and long term solutions must be identified.

New product registrations for management of herbicide-resistant weed populations must be sought.

Issue # 6: Value-added Product Development.

The Issue:

Growers in the root, bulb & leafy vegetable sector would like to take advantage of the growing market-demand for value-added vegetable products. While the technologies for some of these products are well-established, the development of value-added products using fresh onions (e.g. sliced, diced, pureed) is currently restricted by shelf-life limitations.

Current Research/Extension Activities:

- There are no current research activities in this area.
- Jennifer DeEll, Vineland, OMAFRA, has some experience with post-harvest handling of crops and may be able to help coordinate, or advise on the establishment of appropriate research program.
- Kristen Callow, OMAFRA, will be attending a conference on new agricultural products and will be able to share relevant information on new products with growers and potential researchers.

Gaps/Barriers/Deficiencies:

Research is required to develop appropriate handling, packaging and processing practices for value-added fresh vegetable products in order to improve product quality. Research is specifically needed on methods to enhance the shelf-life of value-added onion products.

Issue # 7: Cultivar Evaluations

The Issue:

As most new vegetable varieties are developed in other regions of North America and in Europe there is a continuing need for the evaluation of varieties for suitability to Ontario growing conditions. The reduced number of registered pesticide products makes the evaluation of varieties for pest and disease resistance and for competitive ability against weeds particularly important over the next five years.

Current Research/Extension Activities:

- Shawn Janse and Drs. M.R. McDonald and A. McKeown (University of Guelph, Department of Plant Agriculture) have undertaken the evaluation of root, bulb & leafy vegetable crop varieties at Bradford and Simcoe for many years.

Gaps/Barriers/Deficiencies:

There is an expressed need within the grower community for continued evaluations of root, bulb and leafy vegetable crop varieties for suitability to Ontario growing conditions, storage conditions, market demand, and pest/disease resistance, with emphasis on, but not limited to, carrots and onions.

SWEET CORN

1. Pest Management
2. Nutrient Management
3. Crop Culture

1. Pest Management

Issue

Maintaining a good inventory of pest control products is essential for the success of the sweet corn industry. As products are deregulated, work needs to continue to fill the gaps created by these losses, as well as provide new products for new pest problems (rust, flea beetle, aphids). Sustainable approaches to pest management, and products with reduced environmental impact need to be developed and evaluated in order to reduce the impact on beneficial insects.

Research inventory/current activities

Weed management research is conducted at the University of Guelph facilities at Ridgetown and Simcoe. The committee is pleased that the Horticultural Weed Science position at Ridgetown College has been refilled. Insect and disease management research is also conducted at Ridgetown College. Extension services for the sweet corn industry are offered from the OMAFRA office in Ridgetown. A new project at main campus of the University of Guelph proposes to look at the impact of Bt corn and new sweet corn insect management products on bee colonies.

Gaps/barriers/deficiencies/opportunities

Present efforts in the area of pest management for sweet corn are meeting the needs of the industry to the extent that they can, but it is essential that they continue. Deregulation of pesticides by the PMRA, before new replacements are in place continues to be a concern for Ontario sweet corn growers. Often the holdup for new product registrations is not the efficacy and crop tolerance research, but the speed at which PMRA processes requests. This came to light recently when Lorsban was removed as an insecticide for seed treatment on seed corn; while this was a company initiative, no replacement product is available. Gaucho is an alternative, but it is still under review by PMRA.

Research is also required to document the claims of bee kills caused by insecticides used in sweet corn production. Insecticides with reduced environmental impact and alternative methods of insect management in sweet corn need to be evaluated for their affect on bee colonies.

2. Nutrient Management

Issue

Current data which documents the utilization of nitrogen and phosphorous by a sweet corn crop over the range of environmental and soil conditions experienced in Ontario is lacking. Present nitrogen recommendations, as outlined in OMAFRA Publication 363, are felt inadequate to grow a profitable sweet corn crop, and considerably lower than that recommended in other sweet corn producing regions (for example, neighboring U.S. states). Research which evaluate nutrient application timing and the environmental fate of essential crop nutrients is also lacking.

Research inventory/current activities

Research on the uptake and utilization of nitrogen on sweet corn grown on plastic mulch vs bare soil is being completed at Ag-Canada, Harrow.

Gaps/Barriers/Deficiencies:

Given the pending nutrient management legislation, effort needs to be directed towards providing research data to document nutrient utilization by sweet corn. Information on the loss of nitrogen through leaching and other means during crop development and after the crop is off, and the use of cover crops to trap nitrogen is required, as well as the impact of manures and soil amendments on nutrient planning. It needs to be recognized that the horticulture industry in general does not have the data available documenting crop nutrient uptake and utilization, to the extent that the field crop industry does, and needs time and funds to compile this information.

3. Crop Culture

Issue

In order to remain competitive, continued research is required on crop management to allow Ontario sweet corn growers to provide a quality product in an efficient and economical manner.

Research inventory/current activities

Sweet corn management trials are presently being conducted at Ag-Canada, Harrow, and Ridgetown College. Variety trials are being conducted at Ag-Canada, Harrow, Ridgetown College, New Liskeard Research Station, and Kemptville College.

Gaps/barriers/deficiencies/opportunities

Research needs to continue in the following areas:

1. Evaluation of plant populations, in row spacings, row spacings and their impact of yield and quality in sweet corn. Specific production systems can be developed for certain varieties. This could include fertility programs as well.

2. Use of plastic mulches for advancing maturity; use of biodegradable mulches to offset environmental impact of conventional plastics

3. Identifying factors which contribute to stress and reduced productivity in sweet corn, and identify varieties with tolerance to stressful growing conditions (moisture, air and soil temperature, soil characteristics, plant population). It is felt that certain varieties perform better under stressful growing conditions; these characteristics need to be identified and exploited.

1. Developing management systems for sweet corn productivity with an emphasis on crop quality. Often earliness and yield are emphasized, at the expense of quality. Poor quality corn on the market reflects poorly on the entire industry

MINOR USE PEST CONTROL PRODUCT REGISTRATION WISH LIST - ONTARIO

Sub-Committee: Ontario Sweet Corn Research and Services SubCommittee

Overall Rating	Target Pest(s)	Crop or Crop Group	Potential Solutions (active ingredient)	Potential Solutions (trade name)	Company	Registration Status*			Justification(s) for high ranking***									
						CDA	USA	IR-4**	1	2	3	4	5	6	7	8	9	Other
Entomology Priorities																		
1	Flea Beetle	sweet corn	imidacloprid	Gaucho - seed treatment	Gustafson		x		x		x							Lorsban no longer available as seed treatment
2	seed pests	sweet corn		Cruiser - seed treatment		x	x		x		x							as above. Presently registered as component of 'Helix" seed treatment on canola
3	corn borer	sweet corn	spinosad								x	x				x		
Plant Pathology Priorities																		
1	leaf rust	sweet corn		Headline (BAS 500)												x		
2	3-leaf dieback	sweet corn	difenoconazole	Dividend								x						
3		sweet corn	hexaconazole	Folicur	Bayer							x						
4		sweet corn	azoxystrobin	Quadris								x				x		
Weed Science Priorities																		
1	broad spectrum	sweet corn	mesotrione/metolachlor/atrazine	Callisto/Dual/Atrazine								x				x		
2	Canada thistle, ragweed	sweet corn	clopyralid	Lontrel					x									
2																		

* Registration status: Product/Active registered in Canada for another crop; Product and use registered in USA

** IR-4 Status: I = In progress
C = Completed and submitted to EPA
P = Proposed but not approved or started yet

*** Justifications:

1. No pest control product registered to control this pest
2. New introduced pest problem
3. Old technology replacement (organophosphate, carbamate, EBDC, etc)
4. Resistance management tool
5. Reduced risk, biopesticide or GRAS (generally regarded as safe) product
6. Supports a new IPM approach (pheromone mating disruption, etc.)
7. Export crop with need for harmonized pest control options and crop tolerances
8. More effective therefore leading to pesticide reduction
9. New crop

TENDER FRUIT

RESEARCH PRIORITIES

It is recognized by TFRSSC that there are inter-relationships between these priorities and integrated approaches will provide the best opportunities for progress. With the expansion of the peach industry into new areas, winter hardiness will be a consideration in breeding, orchard management and plant nutrition research objectives.

1.Breeding and germplasm improvement for resistance to pests, diseases and abiotic stresses

- an integrated approach to breeding and germplasm improvement will help sustain the tender fruit industry and maintain its prominent place in Ontario.
- Specific breeding objectives will include:
  - assess germplasm for PPV resistance and screen new potential imports
  - maintain input especially cling stone breeding program
  - fire blight resistance important for pear breeding
  - continuing need for suitable late season processing peach and pear cultivars
  - winter hardy processing peach cultivars for new plantings in the Lake Erie North Shore area

2.IPM for pests and diseases - include FQPA considerations

- maintain research on mating disruption trials for control of OFM and other pests

3.Orchard Physiology and Management

- An integrated approach to conducting orchard physiology and management research will help sustain the tender fruit industry and maintain its prominent place in Ontario.
- To meet the demand for processing peaches, it is anticipated that new orchards will be planted outside the traditional production areas, such as in the most favoured climates north of Lake Erie. Evaluation of productivity, adaptability, and longevity of processing cultivars outside the traditional growing regions of the Niagara Peninsula and South-Western Ontario is required
- Additional research objectives include:
  - orchard training systems for improved fruit quality, production and harvest efficiency.
  - irrigation systems including trickle and sub-surface drip irrigation for water conservation and prevention of pesticide contamination into the groundwater.
  - scion-rootstock interactions in cherry, plum, peach and pear, for tree size control (dwarfing for high density orchards), disease resistance, improved tree habit, hardiness, and production efficiency
  - plant bio-substances
    - gibberellins to regulate flowering and fruiting in order to minimize hand thinning and optimize fruit size
    - ethephon and soybean oil to delay bloom and to construct models to estimate the reduction in risk of crop damage due to spring frosts.

4.Plant nutrition and nutrient management

- need to review OMAFRA nutrient recommendations for orchards

- uptake and removal of nitrogen in a perennial crop (tree) system - impact on timing of fertilizer applications
- review nitrogen and nitrogen:potassium balance
- look into environmental and water quality issues
- interactions: effects of plant nutrition on winter hardiness, fruit quality, storage, etc

5.Post-harvest and fruit quality
- control of brown rot and other postharvest pathogens of all tender fruit
- regulation of fruit ripening for improved quality at harvest and extended storage and shelf life
- prevention of mealiness or chilling injury of peaches and nectarines
- modified atmosphere packaging
- value added products

6.By-products and alternative markets
- for culled fruit (e.g. small 'Bosc' pears)

The 1999 Annual Report of the TFRSSC presented a Table of the on-going general areas of research considered desirable, the priority in terms of need or importance, and the level of research desired.

SERVICE PRIORITIES

1.Economic information for tender fruit crops
- costs of production used for price negotiations

2.Training of IPM personnel
- pest and disease monitoring with consultants, no longer with OMAFRA
- need to ensure scouting personnel are trained

3.PPV education and factsheets to include
- identification
- aphid vectors
- nursery certification program
-

Note: seven priorities were submitted to TFRSSC. These were reduced to four by combining related priorities, then ranked by TFRSSC.

1.Eradication of PPV

2.Fire blight resistance in pear and apple - resistance breeding and genetic transformation
- long-term alternative to chemical control
- pending loss of registration of streptomycin

3.Development and evaluation of sustainable IPM programs to address the dynamic arthropod pest complexes (insects, mites) of tender fruit crops.

- Rationale: IPM is a systems approach; control of one pest element can influence the balance of others within the system.
- Special consideration should be give to:
- control of major pests (e.g. oriental fruit moth, pear psylla, European red mite, plant bug complex)
- secondary pest resurgence and control (e.g. plum curculio, plant bug complex, oblique-banded leaf roller, peach tree borers, mealy bug, aphids, mites, pear blossom midge)
- new pest introductions and/or developments (e.g. pale green weevil)
- evaluation of new pest control products, biological control agents and cultural techniques
- economics of program
- potential impact of Plum Pox Virus on existing and future IPM programs (e.g. vector control)

4.Diseases of stone fruits

- minor use registration
- bacterial diseases
- brown rot

RESEARCH PRIORITIES

1.Nutrient management planning for horticultural crops: There has been minimal research in the past for calibration to determine fertilizer recommendations for horticultural crops grown on Ontario soils. Research is needed to establish "best" fertilizer practices (rates, timing, application methods, fertigation, macro- and micro- nutrients and formulations) for horticultural crops. This information is crucial to enhance the applicability of nutrient management plants to horticultural crop production. Research is needed to evaluate the effectiveness of these nutrients on the yield and especially the quality of horticultural crops.

2.Sustainability in horticulture crop production: The intensive crop management associated with horticultural crop production needs to be supported with continuing research in:

- organic wastes and biosolids: There is ongoing interest in using various waste organic amendments in the horticulture industry by both the waste handlers and growers. Continued research is required to determine the effectiveness and adaptability of these amendments to horticultural production. It is also necessary to determine the effects of potential detrimental products in these amendments such as heavy metals, salts or other chemicals.

- reduced tillage in the industry there has been little adoption of reduced tillage systems for fruit and vegetable production. Research is still needed to identify the level of tillage reduction and the effect of plant residue on vegetable yields for Ontario conditions and soils.

- cover crops are still minimally utilized in fruit and vegetable production in Ontario. Research is needed to determine the best systems to incorporate cover crops into annual vegetable production systems and to determine the best sequences of crops in these systems. Also, ongoing trials and research are necessary to compare cover crops and organic amendments and their effects on soil nematode populations.

3.Efficient use and quality of water: Communities and horticulture production need reliable and quality water. Ongoing research in efficient irrigation systems, timing of irritations and reducing environmental impact form irrigation practices need continued support and development.

4.Nitrate nitrogen test for horticultural crops: Research and fields trials are necessary to evaluate and calibrate a nitrate-nitrogen test for horticultural crops, particular in muck (organic) soils and a pre-sidedress nitrogen test for sweet corn. As well, field demonstrations are needed to evaluate quick test technology for nitrates in both mineral and muck soils. This technology is being used in other parts of the world (particularly North America) but has not been well studied in Ontario.

5.Site specific technology: Research is needed to validate and adapt this new technology which includes such things as remote sensing, GPS mapping and yield monitoring to the horticulture industry.

6.Recommendation to the Ontario Soil Management Research and Services Committee:

Given the high potential impact that nutrient management planning legislation may have on the Ontario horticultural industry, this committee recommends that public funding programs be aimed at promoting and developing environmentally sustainable and cost effective nutrient management research. This recommendation should be directed to OMAFRA, AAFC and the University of Guelph.

RESEARCH AND SERVICES PRIORITIES
ONTARIO TENDER FRUIT PRODUCERS MARKETING BOARD

(Note: These priorities were ranked by OTFPMB)

1.Continue to develop and implement a Prunus certification program for tender fruit

- short-term emphasis on a designation or certification of "PPV tested"
- long-term program for "Prunus certification" to be developed and implemented
- addressed to: OTFPMB, CFIA, OMAFRA, U. of Guelph, OFTA, nursery industry

2.Co-ordinated effort to eradicate Plum Pox Virus in tender fruit in Ontario, and additional research in the following areas

- revitalization of PPV-infected orchards using advances in high density and orchard management systems
- expansion of tender fruit production into harsher climates of Southern Ontario
- search for genetic resources of *Prunus* with high degree of resistance to PPV
- evaluation of existing *Prunus* germplasm that is adapted to northern climates for resistance/tolerance to PPV
- Improvement of *Prunus* genetic resources

3.Fire blight control – alternatives to streptomycin required by the end of 2003

4.Nutrient management and water quality issues – need to be involved in consultation process, and development and implementation of those issues. Needs to be practical to be implemented by growers.

5.Crop protection research and support to the tender fruit industry at AAFC Vineland Station. The industry is very disappointed with the lack of base commitment to replacing vacancies in Entomology and Pathology. The Nematologist position will soon be vacant and there is no indication that this position will be replaced.

PESTICIDE UPDATE

New product registrations

1.Pyramite - miticide from BASF - now registered on pear psylla and all mite species including pear rust mite, European red mite, two-spotted spider mite.

Status of minor use pesticide applications (Note: products currently not registered for use)

1.Confirm - Dow AgroSciences - insecticide

- application for codling moth control on pears
- currently registered on apple

2. Nova - Dow AgroSciences - fungicide

- application for pear scab and powdery mildew (in British Columbia)
- currently registered on apple and grape

3. Avignon - Engage Agro - bird deterrent (methyl anthranilate)

- URMULE made in 2000 by OTFPMB
- PMRA denied application and requested it be resubmitted under a different category with additional data requirements

4. Admire - Bayer - insecticide

- URMULE application for control of cherry fruit fly on cherry (in British Columbia)
- application by Bayer for label expansion to control pear psylla on pear. Product will be useful in rotation with other pear psylla products to avoid resistance.
- currently registered on apple

5. Topas - Engage Agro - fungicide

- application made to control leafspot on cherry
- currently registered on stone fruit for brown rot control

6. Indar - Dow AgroSciences - fungicide

- URMUR application submitted to PMRA over 2 years ago for brown rot control on stone fruit and black knot on plum and sour cherry
- currently registered in the US for brown rot control on stone fruit (top product)
- hoping for registration approved for use in 2002

7. Lorsban - Dow AgroSciences - insecticide

- currently has one year temporary registration
- hoping for renewal for 2002 growing season for control of first generation OFM on peach and nectarine
-

Products to be withdrawn over time

1. Parathion

- Part of the on-going review of organophosphate insecticides in both Canada and the US
- UAP able to sell and distribute wholesale in Canada for 2002 growing season only
- Dealers/depots able to sell the product retail until Aug. 31, 2003
- Growers able to use existing purchased supplies until Oct. 31, 2003
- Registration withdrawn by PMRA effective Oct. 31, 2003
  - no residue tolerance in Canada for all crops (including grapes)
  - use no longer allowed

Registration not renewed and will be phased out

1. Streptomycin

- annual registration renewal for years because of concern re development of antibiotic resistance in human pathogens with its use in plant agriculture
- PMRA requested data package equivalent to complete submission package. Manufacturer/originator does not have the required studies completed, and the Canadian market is too small to warrant the generation of the data for PMRA
- UAP able to sell and distribute wholesale in Canada until end of 2001
- Dealers able to sell product until end of 2002
- Growers able to use product until end of 2003
- No indication of residue tolerance after Dec. 31, 2003
- NOTE: after this point in time, growers will have no alternatives to use for fire blight control during bloom

Other products under consideration - future applications to be made to PMRA

1. Elevate - Tomen Agro - fungicide

- Tomen Agro has given support to OTFPMB to proceed with URMULE application to control brown rot
- currently registered for Botrytis control on grapes and strawberries in Canada

2. Intrepid - Dow AgroSciences - insect growth regulator insecticide

- URMUR application to PMRA for a number of uses on fruit crops

PESTICIDE ISSUES - OTFPMB

Tender Fruit

1. Lorsban (chlorpyrifos) - need PMRA to provide annual temporary registration for 2002. Still working on a 3-5 year temporary registration

2. Disruptive pheromone technology for OFM

- Chugai Boyeki - Rosso has been submitted
- 3M will hopefully submit in 2001
- BASF not sure

3. Indar

- Rohm and Haas agreed to do eco-toxicological studies (compromise with PMRA)
- Completed - PMRA review may take 12 months. Earliest registration late 2002

4. Topas (propiconazole)

- URMULE submitted for PMRA review
- pre-submission consultation completed for cherry leaf spot control.

5. Elevate (fenhexamid) - Tomen Agro

- Company willing to submit URMULE for tender fruit - priorities to include peach, cherry and plum. Company will apply for crop grouping
- For brown rot control of tender fruit
- new family of fungicide, a Rovral replacement
- OTFPMB has supported application. Product is registered in US

Pears

1. Apogee (prohexadione) - BASF

- plant growth regulator available in the US on apples and pears
- used to suppress fire blight and oblique banded leaf roller (Note: not a control agent on its own)

2. Spinosad - Dow

- for control of OBLR

3. Decis (deltamethrin)

- for late season control of OFM. Issue needs to be resolved.

4. Surround (kaolin clay)

- for control of pear psylla
- pesticide alternative product, available in US, not registered in Canada

5. Sovran (kresoxim-methyl) - BASF

- label expansion to include pear scab
- available in US on pears

6. Admire (imidacloprid) - Bayer

- for control of pear psylla

TOMATOES

TOMATO RESEARCH AND SERVICE ISSUES

	ORDER OF PRIORITY	
ISSUE	*PROCESSING*	*FRESH MARKET*
Breeding and Cultivar Development	1	5
Access to Crop Protection Materials/Minor Use Registrations	2	1
Pest Management in Fresh and Processing Tomatoes	3	2
Crop Water Management Through Irrigation and Fertigation	4	3
Nutrient Management	5	4
Availability of Suitable Land and Land Selection	6	6

The availability of suitable cultivars is essential for the processing tomato industry to continue to thrive in Ontario. The Tomato Research and Services Sub-Committee recognizes that the Ontario breeding program has been a key factor in maintaining the competitiveness of the processing industry and has played a major role in yield and quality advances made over the last 10-15 years. All other areas of research are based on having access to suitable cultivars. This sub-committee recommends that the tomato breeding and cultivar program in place in Ontario be continued at the present level. The fresh market tomato group has received little or no benefit from the breeding program but recognizes that cultivar evaluation for the fresh market industry is important. Therefore, breeding and cultivar development has a lower priority for the fresh market industry.

Breeding and Cultivar Development. (P 1, FM 5)

The Issue:
Since 1989 there has been a dramatic and sustained trend of increased productivity in the processing tomato industry in Ontario. By combining improved cultivars with astute management under favourable growing conditions, growers and processors were able to double per-acre yields. The development and evaluation of new cultivars has been the focus of ongoing research work that has laid the foundation for these gains.

The development of new products based on diced tomatoes and the recent work on the nutritional and health benefits of lycopene promise to create strong demand for processed tomatoes in the future. Further gains remain to be made in improving the fruit quality of early maturing cultivars. Bacterial diseases have been a persistent industry problem and newly available sources of resistance are becoming available in commercially adapted material.

Current Research/Extension Activities:
Work is done at the Greenhouse and Processing Crops Research Centre, AAFC, Harrow in tomato germplasm enhancement and in cultivar evaluation and development. The work at Ridgetown College is focused on cultivar evaluation and breeding to bring enhanced germplasm closer to commercially adapted material. Fresh market tomato cultivar evaluation occurs at AAFC, Harrow. Extension services for the tomato industry are offered from the OMAFRA office in Ridgetown.

Gaps/Barriers/Deficiencies:
Current research efforts are addressing the opportunities that will continue to provide a basis for sustained development of the Ontario processing tomato industry. Emphasis should be placed on earliness, disease and pest resistance, reduction in mould counts, fruit firmness, peeled colour, field storage capability and field and factory yield. Cultivar evaluation for fresh market tomatoes should also continue.

Access to Crop Protection Materials/Minor Use Registrations. (P 2, FM 1)

The Issue:
The industry continues to have difficulties with situations where pesticides are registered in the U.S. but not registered in Canada. Canadian growers are often denied (or delayed) access to newer, safer, more target specific, more environmentally friendly and biocontrol materials. Imported food produce from the US is often treated with the products denied to Canadian farmers. The US EPA has committed to deregister pest control products only if suitable alternative control products or measures are available. PMRA has no such policy, therefore, pest control products may disappear in Canada with no suitable alternate control methods in place.

Current Activities:
See **Responses to 2000 Recommendations**, Recommendation number 3.

Gaps/Barriers/Deficiencies:

Improved access to newer, safer, more environmentally friendly and biocontrol materials through the URMULE and URMUR programs is required. The following concerns need to be addressed.

1. Canadian growers require equal access to new pest control products available in the US and this can be accomplished with shared registration and residue levels set at the same time and at the same levels as the US. Canada still has a number of registration requirements unique to Canada which increases the cost of Canadian registrations, slows the process and often results in denial of access to products in Canada.
2. The registration process needs to be speeded up so that Canadian farmers have access to the newer products at the same time as their US counterparts.
3. An office for minor use should be established in Canada to expedite minor use registrations in Canada.
4. Adequate funding for the URMULE and URMUR programs is required. AAFC should continue to fund projects at the 75% level. It is also suggested that OMAFRA split the remaining cost with grower commodity groups.
5. AAFC and the University of Guelph need to provide GLP compliant facilities to ensure that residue and other data development work required to support the minor use program may be carried out.

Pest Management in Fresh and Processing Tomatoes. (P 3, FM 2)

The Issue:

The sustainability of the tomato industry depends on safe, blemish free produce. Continued efforts are needed to address the current and new insects, diseases and weeds that compete with the production of tomatoes. The tomato industry is managing to adapt to the realities of the new approaches and adopt new delivery mechanisms for the implementation of IPM programs in Ontario.

Current Research/Extension Activities:

Currently IPM research is being carried out at Ridgetown College University of Guelph, and AAFC in London and Harrow. The University of Guelph Lab Services assists in diagnosing pests along with OMAFRA specialists stationed at Ridgetown and Harrow. Pest control recommendations for the province have been developed through research trials conducted primarily at Ridgetown and Harrow. The focus has been to identify safe and effective pest control materials such as herbicides, fungicides and insecticides, their proper rates, timing and application.

Gaps/Barriers/Deficiencies:

The following are the issues that need to be addressed:

1. Erosion of IPM support by the public sector. Two years ago the provincial government shifted its focus from grower assistance programs to broader advisory services for IPM. The expectation was for the private sector to fill the growers' needs. However, agriculture is unable to financially support these efforts under our "cheap" food policy. A new approach needs to be developed to greater share the financial risks of conducting IPM "for the good of society."

2. The diagnostic services offered through the diagnostic laboratory of the University of Guelph is not adequate and does not meet the immediate needs for a timely diagnosis of insects, diseases and weed resulting in additional prophylactic sprays which add unnecessarily to the pesticide load in the environment. A project developed by AAFC in London has developed a rapid diagnostic method for bacterial disease identification, yet has not been taken up by the diagnostic lab in Guelph. This valuable service will be lost as the researcher cannot continue to work on a tool that will not be "picked" up by the agency responsible for pest diagnostics in this province. Ridgetown College has offered to provide leadership in offering this procedure for the benefit of the tomato industry.

3. This province needs to better utilize the recent establishment of the Ontario Weather Network at Ridgetown. This program allows for real-time and near-real-time weather information that can be used to deliver pest modeled information resulting in appropriate weather timed spray advice. IPM programs are dependant on scouting and weather information. OMAFRA has supported scouting programs but has yet not adequately recognized the unique opportunity that OWN offers the growers of Ontario. This initiative needs to be supported. Beyond IPM, the Ontario Weather Network can play a vital role in addressing the water utilization issues raised through the recently rapid adoption of irrigation through better managed applications with real time weather information utilizing evapotranpiration values to help determine when to irrigate efficiently. The interest in irrigation was again heightened this past year due to the drought with several communities nearing a level 3 condition which essentially would limit the use of water to grow crops.

4. The seedling tomato industry is relatively new in Ontario, with no pest control materials specifically registered for this industry sector. It took more than two years to persuade PMRA through the Minor Use program to register the bactericide KOCIDE 101 for use on seedling tomatoes. The industry needs a more flexible and understanding PMRA to allow further registrations without the considerable opposition for products that are already on the tomato crop for greenhouse use but for full term tomatoes.

5. The organic market for both fresh and processing tomatoes is generating interest. There is essentially no research to assist any of these growers to adopt this technology.

6. New pest (insect, disease, weed) control product development should remain a focus for tomato research in Ontario. The industry would suffer greatly if one of the most effective pest management tools was limited to the Ontario growers. One of the greatest barriers for the sustainability of the tomato industry is the lack of registered materials. Many of these same materials that PMRA takes considerable time to even consider, our counterparts not only in the US but throughout the world have access to. This puts the Ontario tomato industry in a competitive disadvantage with the potential of losing the industry. To further complicate the registration process a new requirement has been added that being the necessity of GLP procedures to fulfil the residue analysis requirement of PMRA. There is no argument as to the need for GLP, however, the additional cost this will incur will limit if not halt many URMULE applications.

7. Bacterial diseases are persistent problems for both processing and fresh market growers. The development of diagnostic tools and management/control strategies, including biological control,

disease screening of seed and improved methods for detection of bacterial diseases in seed and transplants is a high priority.

8. Food safety is a topic of interest to all Ontario citizens. The effort the tomato research community undertakes greatly improves the health benefits through plant breeding programs, cultural pest management programs and pest control products. This work needs to continue to support the health of the Ontario citizens.

9. The adaptation of new cultural practices such as the rapid adoption of irrigation programs will have a pest management consequence that needs to be understood and addressed. Irrigation may indeed reduce blossom end rot but may increase the mould counts due to anthracnose. Efforts need to be supported to manage this current major shift in growing tomatoes especially in the sandy soils in Essex country.

10. Production practices that have broad support are crop rotation/cover crop/minimum tillage/organic amendment management programs. The sustainability of the fresh and processing tomato crop is being challenged by the lack of productive soils. Weed management systems need to be designed, soil pathogens, insect relationships under these regimes are needed to be addressed.

Crop Water Management Through Irrigation and Fertigation. (P 4, FM 3)

The Issue:
Research in the area of crop water management through efficient and environmentally benign irrigation and fertigation techniques is required.

Most of the processing and fresh market tomato acreage has moved to the lighter, more sandy soil types over the years as weed control and fertility methods have improved. However, these soils tend to naturally have lower crop available water content and often experience a water deficit during the growing season. The weather in recent years has been highly variable, with two dry years out of three. There has been heavy expansion in the use of irrigation in the tomato growing areas of the province. Many growers feel that they bought yield and quality this past year with irrigation.
Within the issue of crop water management there are a number of areas of concern:

Irrigation use expansion
Efficient use of irrigation water
Maximizing yield and quality
Water use restriction through the Ontario Low Water Response Plan
Water quality, both the impact of irrigation practices on water quality and source of quality water for irrigation

Current Research/Extension Activities:
Research at AAFC, Harrow on drip irrigation and fertigation of processing tomatoes has occurred. There has also been extensive work on scheduling of irrigation based upon

evapotranspiration (ET). Newer areas of investigation include controlled drainage schemes to reduce water losses while maintaining drainage, and the use of containment ponds in tandem with sub-irrigation in the growing crop. Work on this project is based on heavier soil types.

There is also a scheduling project at AAFC, Delhi, looking at different ways to manage soil water levels.

Extension activities include information gathering on an international level. There is a series of site specific projects in vegetables that is allowing for the further development of information on irrigation scheduling. There is also a program in the Norfolk area that supports the development of more irrigation ponds to allow for off season trapping of water for irrigation purposes.

Gaps/Barriers/Deficiencies:
The following areas require more research:
1. Efficient use of irrigation water to maximize yield and quality. More research is needed on scheduling of drip irrigation for tomatoes on a variety of soil types. What is the effect on tomato fruit quality such as soluble solids? What is the cost effectiveness of fertigation?

2. Water use restriction. Under drought conditions, water use restrictions are likely. More research is required to determine the critical stages for irrigation and to determine the impact on yield, quality and crop returns with restrictions on water use at various times.

3. Water quality. More research is required in the area of impact of irrigation water quality on yield and crop quality and food safety concerns.

4. Irrigation use expansion - availability of water sources.

Nutrient Management (P 5, FM 4)

The Issue:

Nutrient management research including evaluating current recommendations through crop response research (crop uptake/removal of nutrients and effects on nutritional aspects of tomato), assessments of nutrient application technology, best management practices, nutrient application timing and the environmental fate of essential crop nutrients, with particular attention to nitrogen and phosphorous, is required.

Over the years, quality concerns, harvest timing and a change in varieties for both processing and to a lesser extent fresh market tomatoes have encouraged research trials in the area of soil fertility and crop nutrition. However, much of the work in the past has focussed on economic yield and return to fertilizer dollar rather than potential for leaching and nitrogen use efficiency. The more recent emphasis on nutrient management for manure users and producers has created a need for more complete information on crop uptake and removal and the environmental fate of applied nitrogen and phosphorous. This is needed to ensure that growers are as efficient as possible in their nutrient applications and to ensure the ability/right to apply the necessary crop nutrition with prudent application methods and timing.

Increased funding to carry out nutrient management research is also required.

Current Research/Extension Activities:

There is research being conducted at AAFC, Harrow looking at nitrogen rates as related to yield and quality with different tomato varieties. In addition, another trial looks at reduced tillage and the impact of nitrogen rates as a possible method to compensate for the observed yield drag under some reduced till/no-till programs. Tomatoes are often grown in conjunction with cover crops. In the past, this has been more for the protection from wind and water erosion. There is ongoing work at AAFC, Delhi in the area of cover crops.

Extension activities has included an extensive literature review of all vegetable crops in the area of the nitrogen scavenging value of cover crops and crop removal values for nitrogen. There is a large applied research project being initiated in the area of nitrogen verification (cover crop uptake and crop nutrient removal) which includes nine tomato sites for monitoring. Extension and commodity meeting programs regularly feature a nutrient management topic (eg Processing Vegetable Industry Conference in January, 2002).

Gaps/Barriers/Deficiencies:

The following areas require more research:

1. Basis for the phosphorous recommendations. The nitrogen and potassium recommendations have had some work in the past 10 years, but few if any people appear to know the basis for the phosphorous recommendation. The phosphorous recommendation needs to be updated.

2. Losses/leaching. Information on the loss of nitrogen through leaching and other means during and after the crop and the use of cover crops to trap nitrogen is required.

3. Split application. Information on the efficient use of fertilizer and how to use split applications of fertilizer to best advantage with the least impact on the environment is required. The question of fertigation with many scheduled feedings is part of this.

4. Reduced tillage. The impact of reduced tillage on nutrient management is required.

5. Cover crops. Information on the uptake and predicting the release of nutrients is required.

6. Manure use and organic amendments. How does this impact on nutrient planning?

Availability of Suitable Land and Land Selection. (P 6, FM 6)

The Issue:

Some of the yield enhancement that has occurred in the last several years has resulted from growers renting or purchasing land that has never been used for tomato production. This land produces heavy crops of tomatoes for the first few times it is used, but production seems to decline rapidly after the 2nd or 3rd crops. The reason for this is unknown, but may relate to the build-up of disease in the soil. Fumigation may not be possible in the future due to chemical restrictions, and in any event is very costly. The continued use of heavy equipment can severely compact the soil in fields used for tomato production, resulting in lower yields for following cash crops. Long lasting herbicides such as Pursuit present challenges in finding land that is free of residues that impact on tomato production.

Current Activities:

Current activities such as irrigation, crop rotation, use of organic amendments including cover crops are seen as potential solutions to this problem. Some of these practises such as irrigation are limited due to availability or water and cost.

Gaps/Barriers/Deficiencies:

Cost effective methods to combat the 'replant syndrome' should be investigated, including proper field selection, tillage systems, irrigation and fertility practises, the use of soil amendments including cover crops, fumigation, different crop rotations and choice of herbicides

MINOR USE PEST CONTROL PRODUCT REGISTRATION WISH LIST - ONTARIO

Sub-Committee: Ontario Tomato Research and Services SubCommittee **Submitted by: John Warner**

Overall Rating	Target Pest(s)	Crop or Crop Group	Potential Solutions (active ingredient)	Potential Solutions (trade name)	Company	Registration Status*			Justification(s) for high ranking***									
						CDA	USA	IR-4**	1	2	3	4	5	6	7	8	9	Other
Example	*OBLR, leafhoppers, codling moth, plum curculio*	*Apples (Pome fruit)*	*kaolin clay*	*Surround*	*Engelhard*		*X*	*C*					*X*	*X*				
Entomology Priorities																		
1	Colorado potato beetle	tomato	thiamethoxam	Actara	Syngenta		X				X	X		X		X		Pest control measures are inadequate due to pest resistance to many insecticides
2	CPB	tomato	thiocloprid	Calypso 480SC	Bayer						X	X		X		X		same as above
3																		
Plant Pathology Priorities																		
1	bacterial & fungal diseases	tomato	acibenzolar	Actigard	Syngenta		X					X	X	X		X		Systemic acquired resistance
2	anthracnose, septoria, early blight	tomato	pyraclostrobin	Headline 250EC	BASF			X				X	X	X		X		broader spectrum, more effective
3	as above	tomato	pyraclostrobin	Cabrio 20WG	BASF			X				X	X	X		X		as above
4	as above	tomato	azoxystrobin	Quadris	Syngenta		X					X	X	X		X		as above
5	as above	tomato	cymoxanil + famoxate	Tanos	DuPont							X	X	X		X		as above
Weed Science Priorities																		
1	broadleaf weeds	tomato	thifensulfuron-methyl + metribuzin	Pinnacle + Sencor	Dupont Bayer	X X	X X					X				X		Limited choices avail. Mixtures provide broad spectrum weed control. Controls problem weeds.
2	hairy nightshade, bdleaf weeds	tomato	rimsulfuron + metribuzin	Prism + Sencor	Dupont Bayer	X X	X X			X		X				X		same as 1 above
3	triazine resist. lambsquarter	fresh market tomato	thifensulfuron-methyl	Pinnacle	Dupont	X	X					X						
4																		
5																		
Plant Growth Regulators, Other priorities																		
1	growth regulator	tomato	paclobutrazol	Bonsi, Confer	Syngenta	X	X							X		X		Improves quality of plug transplants and harvest earliness.
2																		
3																		

*_Registration status: Product/Active registered in Canada for another crop; Product and use registered in USA

** IR-4 Status: I = In progress
C = Completed and submitted to EPA
P = Proposed but not approved or started yet

*** Justifications:

1. No pest control product registered to control this pest
2. New introduced pest problem
3. Old technology replacement (organophosphate, carbamate, EBDC, etc)
4. Resistance management tool
5. Reduced risk, biopesticide or GRAS (generally regarded as safe) product
6. Supports a new IPM approach (pheromone mating disruption, etc.)
7. Export crop with need for harmonized pest control options and crop tolerances
8. More effective therefore leading to pesticide reduction
9. New crop

RECOMMENDATIONS ARISING FROM THE GAPS/BARRIERS/DEFICIENCIES

AGROFORESTRY

. Results-Based Logical Framework Analysis (Agroforestry Research and Development, University of Guelph).

Narrative Summary	Expected Results	Performance Measurements	Assumptions/Risk Indicators
Overall Project Goal	**Impact**	**Performance indicators**	**Assumptions**
To identify agroforestry research and service needs that will address societal concerns related, but not limited to, climate change mitigation processes, nutrient management and water quality through agroforestry-based land-use practices in Ontario	Augmentation of C sequestration and reduction of GHG emissions in Ontario agroecosystems through agroforestry-based land-use systems. Positive contributions to water quality and nutrient management through agroforestry-based land-use systems	Quantification of C sequestration rates in current agroforestry land-use systems in Ontario. Quantification of potential C sequestration in marginal and degraded lands in Ontario through the adoption of temperate agroforestry systems. Quantification of GHG emissions reduction (nitrous oxide) and GHG emission offsets (methane) in Ontario. Improvement in water quality indices. Quantification of efficient management of N fertilizers.	Environmental factors and Ontario climate remain the same with least climate extreme frequencies. Sufficient research funding becomes available to execute individual project objectives. More interaction / awareness among partners such as federal and provincial governments, private sectors, farmers, relevant industries, environmental and non governmental groups etc. is possible. Policy issues relevant to agroforestry land-use are promoted (provincial or national)
Specific Project Objectives	**Outcomes**	**Performance indicators**	**Assumptions**
1. To develop a GPS / GIS database for all agroforestry systems in Ontario	Availability of reliable and accurate provincial agroforestry related research, social, environmental and statistical data.	Development of GPS coordinates and mapping of all agroforestry related land-use systems in Ontario. Development of various GIS information/data layers for provincial agroforestry systems (e.g. C sequestration numbers, GHG emission reduction numbers, site specific growth indices for tree species in agroforestry systems)	Same as above
Specific Project Objectives	**Outcomes**	**Performance indicators**	**Assumptions**
2. To quantify C sequestration and to model C dynamics in province-wide agroforestry-related land-use practices	Provincial C sequestration values for various temperate agroforestry systems will become available. This	C sequestration 'numbers' for tree-cereal intercropping, orchard tree-based intercropping, windbreaks,	Same as above

(e.g. tree-cereal intercropping, orchard tree-based intercropping, windbreaks, riparian buffer strips, silvopasture, forest farming etc.)	information will be of value to climate change mitigation processes, policy development etc.	riparian buffer strips, silvopasture, forest farming systems in Ontario	
3. N Fertilizer management and potential nitrous oxide emissions reduction			
3.1 To quantitatively measure nitrate-nitrogen losses from an intercropped system and from an adjacent monocropped system.	Efficient utilization of N fertilizers and less detrimental impacts on the environment through tree-based intercropping systems	Quantitative measurements of nitrate-nitrogen losses from an intercropped system and from an adjacent monocropped system.	
3.2 To quantitatively assess the nitrate-nitrogen capturing ability of fast growing and slow growing tree species in an intercropped situation.	Documentation of nutrient cycling ability of fast-growing and slow-growing tree species in agroforestry systems.	Quantification of nutrient cycling by trees in agroforestry systems	
3.3 In conjunction with 3.1 and 3.2 to validate the existing hypothetical model of N-cycling in intercropped and monocropped situations.	Creation of N cycling model for tree-based intercropping systems and for conventional agricultural systems in Ontario	N cycling models for tree-based intercropping systems and conventional agricultural systems.	
3.4 To quantify N_2O reduction potentials in tree-based intercropping systems.	GHG emissions reduction potentials in tree-based intercropping systems	Quantification of N_2O emission reductions.	
Specific Project Objectives	**Outcomes**	**Performance indicators**	**Assumptions**
4. Improving rural water quality through tree-based agroforestry systems			Same as above
4.1 To quantify potential bacterial pollution from agricultural practices using *E. coli* NAR as a biotracer.	Documentation of bacterial pollution from agricultural practices and proving the usefulness and efficiency of using *E. coli* NAR as a biotracer.	Bacterial contamination and runoff data from agricultural fields	
4.2 To determine the extent of bacterial movement from	Potential reduction of bacterial contamination through tree-based intercropping systems.	Quantification of water quality indices for both systems	

manured tree-based intercropping fields and from manured conventional agricultural fields through tile drains to surface water under normal agricultural practices.			
4.3 From objective 4.2, to quantify the bacterial filtering ability of tree roots in tree-based intercropping systems.	Identification and documentation of low-cost but potentially efficient tree-based filtering mechanism	Quantification of the filtering capacity of fast-growing tress species in a tree-based intercropping systems	
Specific Project Objectives	**Outcomes**	**Performance indicators**	**Assumptions**
5. Remote sensing applications in agroforestry systems			Same as above
5.1 Acquisition, processing and calibration of Compact Airborne Spectrographic Images (CASI) to generate CASI- hyperspectral reflectance data for the agroforestry test site, University of Guelph.	Development of a new methodology to derive information from CASI-hyperspectral reflectance data and compare that with ancillary ground data sets so that CASI images could be used to measure agroforestry related parameters.	Acquired, processed and calibrated CASI data for the agroforestry test site, University of Guelph.	
5.2 To quantify and model C sequestration rates in tree-crop ecosystems (introducing trees into agroecosystems to augment C sequestration in agroecosystems) and to explore relationships to CASI reflectance imagery.	Development of C sequestration model based on CSAI reflectance imagery.	Quantified C sequestration values for tree-based intercropping systems using CASI data.	
5.3 To quantify N transfer from tress to associated crops using CASI-hyperspectral data – for better N management in agroecosystems and to quantify the potential reduction in N_2O emissions from agroecosystems.	Development of a methodology with the use of CASI- hyperspectral data to monitor and enhance N use efficiency. This information will be valuable for precision farming and for the use of Variable Rate Technology (VRT).	Nitrogen (N) transfer from trees to associated crops will be determined by comparing CASI measurements of test plots of fixed N application to CASI measurements of the tree-crop plots. In this manner N calibration of the hyperspectral data will be developed allowing better N fertilizer management in agroecosystems. This will also lead to quantification of the potential reduction in N_2O emissions from agroecosystems, a major source of greenhouse gas emissions.	

APICULTURE & POLLINATION

Apiculture and Pollination Recommendation(s) Arising from the Identified Issues:

The Apiculture and Pollination Sub-committee will work on these continuing issues

APPLE

Recommendation # 1:

1.Issue

The Pest Management Regulatory Agency (PMRA) is threatening to cancel the registration for streptomycin based on the concern that the use of antibiotics in agricultural production might produce populations of antibiotic resistant bacteria which could potentially cause human health problems.

2.Background

- Streptomycin is currently the most effective chemical registered to control fire blight, a devastating disease caused by the bacteria *E. amylovora*, the bacteria that causes the blossom blight stage of fire blight.
- 84.7% of apple trees in Ontario are grown on rootstocks that are considered to be moderate to highly susceptible to fire blight (M9, M26, MM106), and over 64 % of the varieties of apples grown in Ontario are considered to be moderate to highly susceptible to fire blight.
- The loss of this product has the potential to destroy the economic viability of growing apples and pears in Ontario.
- Fire blight bacteria can spread quickly within and between orchards, killing trees and decimating entire orchards.
- Currently there are no products in development that are considered to be viable replacements for streptomycin for control of blossom infections.
- Apart from other antibiotics, there are no chemicals available that provide the same level of control of fire blight bacteria.

3.Recommendation

The Pest Management Regulatory Agency should continue to renew the registration of Streptomycin on a yearly basis, until viable alternatives are registered to control fire blight.

4.Target Agency

Wendy Sexsmith, Pest Management Regulatory Agency, Health Canada

5.OASCC Linkages

Ontario Pest Management Research and Services Committee

Recommendation # 2:

1.Issue
Management of reemerged apple postharvest diseases

2.Background
In the 2000-2001 season a severe increase of blue mold was observed in stored apples, particularly of cv. Empire. Blue mold, caused by *Penicillium expansum* and gray mold caused by *Botrytis cinerea* are the two most common postharvest diseases of apples in Ontario. The drench treatment immediately before cold or CA storage is intended to control wound infections that occurred during harvesting, and also to prevent infection of wounds from fungal spores in the drench fluid. The literature indicates that the development of fungicide resistance in *P. expansum* has resulted in an increase of storage rots in New York state. The increase of blue mold, in New York, is also attributed to the development of resistance in the pathogen to the anti-scalding agent diphenylamine (DPA), which also has some fungicidal properties. Fungicide resistant P. *expansum* has been reported from British Columbia in Canada, however, TBZ-resistant *P. expansum* has not been reported in Ontario. The current concern is that the increase of blue mold in Ontario apple storages may be due to the development of resistance in *P. expansum* to thiabendazole (TBZ)/diphenylamine (DPA). In addition, a recent report indicates that rotted apples may allow growth of the human pathogen *E.coli*. Increase in the postharvest rots places Ontario growers at a competitive disadvantage in worldwide market. Therefore, research should be conducted to determine the cause for increase of rots in stored apples in Ontario and identify alternative (biological and chemical) control measures to the postharvest fungicides that are currently in use.

3.Recommendation
Ontario Apple Research and Services Subcommittee recommends that both Agriculture and Agri-Food Canada (Vineland) and OMAFRA allocate resources to conduct research to determine causes for the reemergence of postharvest diseases of apple and investigate the efficacy of current and potential new fungicide technologies and biological control agents against blue mold and gray mold of apple.

4.Target Agency
Dr. Gilles Saindon, Director, SCPFRC, AAFC, London
OMAFRA

5.OASCC Linkages
Ontario Pest Management Research and Services Committee

Recommendation # 3

1.Issue
Loss of Industry Structure

2.Background

Following the result of the Expression of Opinion vote last winter and at the recommendation of the Ontario Farm Products Marketing Commission, Agriculture Minister Brian Coburn dissolved the Ontario Apple Marketing Commission on October 23, 2001. Ontario's apple producers no longer have a grower organization to represent them and able to bring forward issues that are of vital interest to apple growers.

3.Objective
Province-wide grower meetings, continuous communication with growers and consultation with government will all be necessary as the process moves forward over the next few months. Support of OMAFRA officials will be important to the ongoing work of the Steering Committee and its goal to help develop a new structure and organization for Ontario apple producers.

4.Recommendation
It is recommended that the Ontario Ministry of Agriculture, Food and Rural Affairs support the work of a newly appointed Apple Grower Steering Committee that will be responsible for investigating with growers the need for a new organization, what it might do and how it might be funded.

5.Target Agency
Target Agency: OMAFRA

BERRY CROPS

RECOMMENDATION # 1

Issue: Continued Support for the Ontario Berry Crop Plant Propagation Program

Background: The Ontario Berry Growers Association (OBGA) has taken a leadership role since the mid 1970's in developing and maintaining a successful plant propagation program in Ontario. This program was originally a partnership between OMAFRA, HRIO and AAFC. The OBGA assumed administration of this program from OMAFRA in 1994. The program is designed to provide Ontario berry crop propagators with a reliable supply of high quality, virus tested, Ontario-grown planting stock.

Disease-tested Nuclear stock plants are maintained and propagated under conditions which reduce the chances of disease infection. Plants propagated in isolation from these clean stock plants are then propagated in a screenhouse run by the OBGA at the Department of Plant Agriculture, Vineland. Plants from the screenhouse are distributed for a cost to the plant propagators for further multiplication.
The cornerstones of any clean stock program are the ability to: determine whether viruses or other pathogens are present; eliminate virus from diseased stock; and maintain clean stock plants. As routine virus-testing services for berry crops are no longer available in Canada, the industry requires the support of a virologist to develop its own virus testing services.

The SPUD Unit at the New Liskeard Agricultural Research Station, University of Guelph maintains and micropropagates the disease-tested Nuclear strawberries which form the foundation of the strawberry plant propagation program. It is also integral in propagating new strawberry selections for release from the University of Guelph breeding program. The OBGA is investigating consolidating the micropropagation and virus testing parts of the program at the SPUD Unit. Preliminary approval was received from CanAdapt and the Northern Ontario Heritage Fund for the start-up costs, however recent uncertainty has delayed further development of this program.

Recommendation: It is recommended OMAFRA and the University of Guelph maintain the infrastructure at the SPUD Unit in New Liskeard and the Department of Plant Agriculture in Vineland, and that the support of a virologist be made available to the plant propagation program by AAFC.

Target Agencies:

- Deb Stark, Assistant Deputy Minister, Research and Corporate Services Division, OMAFRA
- Alan Wildeman, Vice President Research, University of Guelph
- Gordon D. Dorrell, Assistant Deputy Minister, Agriculture and Agri-Food Canada

OASCC Linkages: Ontario Potato Research and Services Committee

RECOMMENDATION # 2

Issue: Continuity of Nematology Research

Background:
This committee appreciates the valuable work of the nematology research program at Agriculture and Agri-Food Canada in Vineland. We have submitted this recommendation a number of times and received affirmative replies that the position will be filled at the time of retirement of the current nematologist. However, given the importance of this discipline to the horticultural crops produced in southern Ontario and the fact that the AAFC Research Branch is currently undergoing a broad evaluation and re-organization, we would like to repeat our request that the nematologist research position at Vineland be filled.
Recommendation: It is recommended that AAFC fill the nematologist research position at the Vineland facility of the Southern Crop Protection and Food Research Centre.

Target Agency: Gilles Saindon, Director, Southern Crop Protection and Food Research Centre (SCPFRC), Agriculture and Agr-Food Canada (AAFC)

OASCC Linkages: Ontario Pest Management Research and Services Committee

RECOMMENDATION # 3

Issue: Nutrient Management

Background: Current fertility recommendations for many crops in Ontario are based on research conducted many decades past. Since that time, cultivars and production practices have changed and yields have increased. In light of the proposed Nutrient Management Plans which will be developed for all crops in Ontario, it is essential that the guidelines and regulations of the proposed Nutrient Management Act be based on valid research applicable to Ontario conditions.

Recommendation: It is recommended that any fertility recommendations for crops in the guidelines and regulations of the proposed Nutrient Management Act be based on valid research applicable to Ontario.

Target Agency: Jim Wheeler, Assistant Deputy Minister, Agriculture and Rural Division, OMAFRA

OASCC Linkages: Ontario Soil Management Research and Services Sub-Committee

CRUCIFER CROPS

Recommendations to OHCRSC and OPMRSC

Recommendation 1:

Issue:
The rutabaga industry faces the prospect of major crop losses from cabbage maggot due to loss of currently registered pest control products, reliance upon only one control option and few if any available alternatives.

Background
Rutabaga growers in Canada have lost access to cabbage maggot control options in the past several years leading to reliance upon only one group of insecticides, the organophosphates Lorsban and Counter. Both of these materials are under review by the Pest Management Regulatory Agency and may be lost or restricted for this use. In addition, the use of one group of organophosphates repeatedly will lead to insecticide resistance and loss of control.

The OCCRSC wishes to emphasize the urgency of the situation to PMRA of Health Canada, AAFC Research Branch and the University of Guelph's Ridgetown College which conducts rutabaga research at the Huron station. Until suitable alternatives can be developed and registered in Canada, it is vital that the PMRA maintain registration of currently labeled pest control options which are presently the minimum required.

A comprehensive research program which identifies and evaluates effective alternatives to currently labeled insecticides is urgently needed.

Recommendation:
In light of the urgent need for the rutabaga industry to address an increasing problem with cabbage maggot control options, the OCCRSC recommends to Agriculture and Agri-Food Canada Research Branch, London and to University of Guelph's Ridgetown College that a comprehensive research program be implemented for cabbage maggot management on rutabagas. Recognizing the response received to this recommendation in 2001, the OCCRSC wishes to see a clear and concise research plan put into place in 2002.

In addition the OCCRSC wishes to strongly remind the Pest Management Regulatory Agency of Health Canada that they must consider carefully any reviews of pest control products for rutabagas as there are presently no alternatives to currently labeled materials.

Target Agencies:

- G. Saindon, AAFC, Southern Crop Protection Research Center, London
- G. Ablett, University of Guelph, Ridgetown
- D. Chaput, Health Canada, Pest Management Regulatory Agency

OASCC Linkages:
Ontario Pest Management Research and Services Committee

Recommendation 2:

Issue:
Despite recent activities of both PMRA and EPA to 'harmonize' regulatory processes, at the grower level there remains a major discrepancy between Canadian and US growers with regard to access to effective, reduced risk, biopesticide and seed treatment pest control options.

The impacts of FQPA (USA) and re-evaluation (Canada) decisions are far greater for Canadian growers because of a lack of access to alternative replacement products.
The cost for research institutions to become GLP compliant and maintain this compliance is far beyond what the minor use program can sustain. If research institutions that the minor crops industry relies upon for residue studies continue to lose money, they will be lost.

Background
Despite recent efforts towards joint reviews, supposed 'biopesticide' harmonization, proposals for seed treatment harmonization and current URMULE and URMUR programs, the reality for growers is that there is virtually no harmonization with US growers. Excessive residue trial requirements in both Ontario and Quebec, lack of use of crop groupings, poor interest by registrants in the URMUR program and lack of access to reduced risk, biopesticide and seed treatment pest control options continue to put unnecessary pressure on already struggling minor crop producers.

Researchers, extension personnel, industry and grower cooperators require adequate, consistent and stable funding to ensure completion of requirements under the minor use system. More flexibility with regard to funding minor use projects is required and more communication with the sponsors of minor use projects is needed.

Additionally, for research institutions to consider GLP compliance or to maintain GLP compliance a stable financial commitment is required so that minor use projects can be completed in a cost-effective manner.

Recommendation:
The removal of the crop residue subzones 5B, 7A, and 1A must occur if progress towards minor use is to be achieved. (PMRA)

The application of crop group labels for registration of safe and effective crop protection materials is necessary (PMRA)

True harmonization of data requirements for seed treatment registrations is necessary so that minor crop growers have access to this excellent risk reduction strategy. (PMRA)

The use of the US 'reduced risk' classification on minor use submissions for products that are classified as such in the USA is necessary. (PMRA)

The use of a more inclusive 'biopesticides' category in Canada is also necessary so that growers have equal access to these risk reduction tools. (PMRA)

A more responsive and cost-effective URMUR program is needed to secure access to many products currently only available to US producers. Registrants, sponsors and PMRA need to work closely together on each URMUR submission. (PMRA and CropLife Canada)

When funding is approved for URMULE projects, researchers should be able to request an advance on the approved funds so that research can be initiated in a more cost-effective manner (AAFC)

Stable funding is needed from the University of Guelph and AAFC to provide base support to research facilities who have invested in GLP compliance. (U. of G., AAFC, Research Branch)

AAFC should set aside funding to establish an "office of Canadian minor use" that could coordinate and facilitate the needs of all minor crops commodities in Canada. The concept of an "IR-4 North" coordinating office which can provide study directorship to minor use projects is recommended. (AAFC, Policy Branch)

Target Agencies:
- D. Chaput, Health Canada, Pest Management Regulatory Agency
- P. MacLeod, Crop Life Canada
- B. Boddis, AAFC, Policy Branch
- J. O'Sullivan, University of Guelph, Plants Program

- G. Saindon, AAFC, Research Branch, SCPFRC, London
- G. Dorrel, ADM, AAFC, Research Branch, Ottawa

OASCC Linkages:
Ontario Pest Management Research & Services Committee

Recommendation 3:

Issue:
Funding for research which sustains a viable and healthy food supply has dwindled in recent years. Long term, stable and adequate funding is required so that researchers can adequately address issues and develop improved integrated crop management programs for growers.

Background
During the course of the Food Systems 2002 program, many successful and economically sustainable research and development projects have led to significant improvements to IPM programs and pesticide reduction. According to recent figures, there has been a 40% reduction in the amount of pesticide used in Ontario and a concurrent 40% reduction in the risk associated with their use. It was also identified that further public resources be targeted to fruit and vegetable crops.

The development of IPM and more recently ICM (Integrated Crop Management) programs requires a stable and dedicated source of funding to ensure that new problems and serious on-going problems are addressed. In light of the general 'public good' that such programs have achieved to date, it is recommended that they be fully supported in the future.

Recommendation:
In light of the success of the Food Systems 2002 program to date, this committee wishes to convey to OMAFRA and University of Guelph the need to continue support towards research which accomplishes the goals and philosophy of the FS2002 program. The goal of improved integrated vegetable crop management strategies leading to high quality food supplies requires a long-term and dedicated commitment. The OCCRSC wishes to request that annual funding for any new FS2002-like programs be returned to the $800,000.00 level.

Target Agencies:
- University of Guelph
- OMAFRA, IRMB

OASCC Linkages:
Ontario Pest Management Research and Services Committee

Recommendation 4:
Issue:
Resources to implement effective and leading-edge nutrient management programs are not available to minor crop producers such as crucifer crops. Without a financial commitment from the agencies developing this legislation, vegetable crop producers will not be able to effectively implement adequate nutrient management plans.

Background
The Ontario Crucifer Crops Research and Services Committee recognizes the need for the development of detailed nutrient management profiles for all vegetable crops including 'crucifer' crops. To utilize crop nutrition inputs effectively and still maintain crop yields and quality an integrated crop fertility program must be developed which takes into account crop removal data, crop uptake data and growth stage models. New recommendations may be necessary which reflect the results of new research. By implementing such research now, a proactive, detailed and responsible nutrient management plan can be developed.

Recommendation:
The Ontario Crucifer Crops Research & Services Committee requests that OMAFRA and Agriculture & Agri-Food Canada establish dedicated funding for research in the area of 'Nutrient Management Planning' specific to Ontario's horticultural crops including 'crucifer' crops.

Target Agencies:

- OMAFRA
- Agriculture & Agri-Food Canada
- University of Guelph

OASCC Linkages:
Ontario Horticultural Crops Research and Services Committee

Recommendation 5:

Issue:
Because GLP compliance is required for minor use residue studies, more GLP compliant sites at public research institutions is necessary. Without access to GLP compliant research facilities many minor use needs will not be adequately met. The delays in the minor use system already place Ontario growers at a disadvantage in the worldwide marketplace.

Background:
Starting with the year 2001 growing season, all residue trials had to be conducted as GLP compliant. A large number of minor use projects are proceeding or being planned for vegetable crops in the coming years. If the field stations we rely upon to conduct these trials are not GLP compliant, the trials cannot proceed and many minor uses may not be completed. Most minor uses are already delayed by funding problems and other PMRA requirements. In light of the US FQPA and several serious pest management problems in crucifer crops and other vegetables, the

minor use system is the only mechanism available to address grower's concerns and the sustainability of the industry.

Recommendation:
It is recommended that the University of Guelph, Ridgetown and Agriculture & Agri-Food Canada (Delhi, Vineland, St. Jean sur Richelieu) move to certify personnel and field station sites as GLP compliant in time for the 2002 growing season

Target Agencies:

- G. Ablett, University of Guelph, Ridgetown
- G. Saindon, AAFC, Research Branch, SCPFRC
- D. Demars, AAFC, St. Jean sur Richelieu, Quebec

OASCC Linkages:
Ontario Pest Management Research and Services Committee

GINSENG

RECOMMENDATION #1
Federal funding of research on Natural Health Products.

Background:
Funding is being made available through the new Office of Natural Health Products to study ginseng. The funding specifically lists Siberian ginseng, *Eleutherococcus senticosis* and Asian ginseng, *Panax ginseng* but does list American ginseng, *Panax quinquefolius*. This type of exclusivity give the impression that Canadian tax dollars are being used to fund those crops that compete directly with crops grown here commercially.

Recommendation:

a) That funding provided by the Office of Natural Health Products for the study or analysis of herbs includes the species of selected herb that is produced or wildcrafted in this country.
b) That funding be provided by the Office of Natural Health Products to educate consumers about the various species of ginseng available to them.

Directed to:
Office of Natural Health Products, HC
AAFC
OMAFRA

RECOMMENDATION#2
Nutrient Management

Background:
Little, if any, information exists for ginseng regarding the effective or efficient use of nutrients including micro and macro nutrients and manure. As growers move onto sites that are less suited to the production of ginseng they are increasingly adding manure and nutrients to "fix: the site. Excessive use of manure in some cases has led to the development of rusty root. Excessive use of boron has led to yield and quality losses on a number of occasions. Until basic recommendations are established growers are at the mercy of all those who would sell them a quick, and often expensive, cure.

Recommendation:
a) That funding be made available to establish crop removal, and uptake numbers and
b) That nutrient recommendations be developed that are based on crop needs that address both quality and yield.

Directed to:
AAFC
OMAFRA

1.GLP:

Background:
There are few sites available for use in trials requiring GLP. GLP certified sites are required for minor use trials to collect residue data. The lack of certified sites has made it difficult to proceed with URMULE applications that move the Ontario ginseng industry toward better and lower risk pesticides.

Recommendation:
a) That financial assistance be made available to establish accessible GLP-certified sites for minor use trials.
b) That funding be made available to train personnel in GLP certification, coordination and supervision.

Directed to:
AAFC
OMAFRA

RECOMMENDATION #3
Rapid diagnostic techniques

Background:
In order to effectively control diseases in ginseng, growers must have ready access to accurate and fast diagnosis of plant diseases. Growers must make costly decisions in a short period of time. Delay in applying control products can cause losses in both yield and quality. Accurate diagnosis is critical in choosing the right control product.

Recommendation:

a) That funding be made available to establish rapid diagnostic procedures and train staff in their use.

b) That diagnostic staff be increased during peak growing months to accommodate grower demands for quick turn-around.

Directed to:
OMAFRA, ARD
OMAFRA, Risk Management
U of G Lab Services

RECOMMENDATION #4
Pesticide Harmonization:

Background:

Global markets are becoming increasingly competitive, especially for agricultural products. Canadian, and Ontario, farmers have been burdened with the costs of providing a safe workplace, assurance of environmental responsibility and the use of highly regulated products for pest control. It is often to the advantage of competitors in the U.S. that they have access to new, low risk, control products that Canadian and Ontario farmers do not have. By using data collected in the U.S. on the same crop group and in the same crop map zone our farmers would have equal access to new, low risk products. This would increase consumer confidence on Canadian and Ontario produce and strengthen market share.

Recommendation:

That PMRA through Health Canada, accept crop grouping and harmonize crop mapping with the U.S.

Directed to:
Health Canada
AAFC
PMRA
Environment Canada

RECOMMENDATION #5
Canadian Equivalent of IR4

Background:

Minor use registration in the U.S. has been facilitated by the establishment of a body that coordinates data collection and sharing. Canada does not have an organization that functions in this manner. In the U.S. it is independent of government agencies but funded with government dollars. The IR4 has made it possible for growers to access information necessary for minor use registration and to coordinate GLP certified trials for data collection.

Recommendation:
That the Canadian equivalent of IR4 be established as an independent, arms-length, organization to assist the agricultural community with minor use submissions.

Directed to:
AAFC
OMAFRA
Health Canada

GRAPE & WINE

1. Inadequate "Crop Protection Research" capacity to address important insect, mite and disease problems in grapes.

2. Loss of conventional organophosphate and carbamate insecticide products with a lack of replacement registered products to control grape pests.

3. Inadequate resources to conduct Good Laboratory Practices (GLP) residue trials to support Minor Use Registration Expansion Programs.

4. Lack of harmonization of pest control products to support an expanding grape and wine industry. This could result in reduced global competitiveness and loss of both domestic and export market sales.

Ontario Grape and Wine Research and Services subCommittee 2001-R1

Issues With Recommendations

RECOMMENDATION #1:

1.Issue:

- Inadequate Crop Protection Research capacity to address important insect, mite and disease problems in grapes.

2.Background

- The **entomology position (ecologist)** position has been vacant since late 1998. The initial request to fill this position was presented in 1998. It is our understanding that this position is still not filled after two rounds of searches and interviews.
- The **pathology position** has been vacant for almost one year and this greatly breaks the continuity of research needed to address pressing problems facing the grape and wine industry. Dr. J. Northover retired in March 2001. This position has been a key one for pathology on both tree fruit and grapes and was clearly listed as a priority in the Plant

Pathology Review of the Vineland Fruit Program in January 2000. There has been one round of interviews for the position, but all candidates were deemed not qualified.

3.Gaps/barrriers/deficiencies:

- With important changes in the pest complex and pest control options, the vacant ecology position leaves a critical gap in the entomology program. With new technologies now available such as disruptive pheromone products, a reduction in available older chemistry (e.g. the FQPA re-evaluation process) and shifts in population dynamics (e.g. mites and leafhoppers on grapes) further modifications of the grape IPM program are needed. With the current pheromone mating disruption work on grape berry moth completed, there is currently no new field investigation projects underway or senior research scientists addressing the mite and insect problems facing the grape industry.
- With the current crisis involving plum pox, the remaining plant pathologist/virologist at Vineland is focusing on developing research to address this quarantined virus. There are currently no projects underway addressing grape disease management at AAFC. FQPA is also expected to have an impact on the availability of fungicides for disease control on grapes.
- There are several other plant pathologists at AAFC, Vineland, but they are on well-defined contracts focusing on particular research projects. Short-term contract staff cannot take on new areas of research and provide long-term continuity to research programs.

4.Details:

- Increase man hours and staffing time devoted to grape crop protection research.
- Increase man hours and staffing time devoted to improved monitoring methods, thresholds and alternative control methods for grape berry moth, leafhopper species and European red mite.
- Increase man hours and staffing time devoted to integrated disease management of grapes.

5.Recommendation:

- It is recommended that SCPFRC London and the National Program Leader of AAFC Research Branch move forward quickly to address the research gaps ecology, monitoring methods, predictive models and control of grape insect and mite pests, as well as, the epidemiology and control of grape fungal diseases such as powdery mildew, botrytis bunch rot, downy mildew, black rot and phomopsis

6.Target agency:

- Dr. Gilles Saindon, Director of AAFC – SCPFRC, London
- Dr. Gary Whitfield, Director of AAFC – Harrow Research Centre
- Also Forward to National Program Leader, Research Branch, AAFC.

7.Oascc linkages:

- Ontario Pest Management Research and Services Committee

RECOMMENDATION #2:

1.Issue:

- Impact of Pesticide Re-evaluation Regulations USDA-EPA- Food Quality Protection Act FQPA) and Parallel Pest Management Regulatory Agency (PMRA) review/re-evaluation - Loss of conventional organophosphate and carbamate insecticides products with no replacement or registered products to control certain grape pests.

2.Background:

- The regulatory reviews and pesticide label revisions announced by the USA-Environmental Protection Agency, re: the Food Quality Protection Act, combined with Canada's Pest Management Regulatory re-evaluation of the organophosphate(OP) and carbamate insecticides have the potential to adversely affect the grape industry. In the year 2001 Guthion (azinphosmethyl) re-entry periods were increased to 28 days, thus severely constraining viticulture and pest control practices, EPA (PMRA likely to follow) may remove grapes from the azinphosmethyl label for 2002, and the loss of grapes on the other OP and carbamate insecticide labels are likely to follow shortly thereafter.

- Juice grape growers rely on shipping their crop for processing to the USA. This would leave no alternative products if Ontario growers needed to comply with USA tolerances. This would result in lost export market sales.

- Similarly, wine grape producers are also dependent on shipping surplus wine grapes to the USA to processors. This would also result in lost export market sales and revenues for Ontario producers.

3.Gaps /barrriers/deficiencies:

- No products to control leafhoppers, phylloxera, or mealybug,
- No conventional insecticide products to support mating disruption technology when intervention controls for grape berry moth are required.
- Inadequate research (both efficacy and residue) to support minor use registrations of alternative control products.

4.Details:

- Increase AAFC research resources (both efficacy and capacity to do GLP residue trials) for alternative products to control grape berry moth, leafhopper species, phylloxera, and mealy bug.
- Delay dropping grape from key insecticide control product labels until new replacement products are registered.
- Pursue emergency registration and/or fast track, as well as harmonize registration of replacement products being pursued in the USA such as methoxyfenozide (Intrepid) and Pyriproxyfen (Esteem) for grape berry moth control, and Actara and Admire for leafhopper control.

5.Recommendation:

- That both AAFC and PMRA increase resources to provide insect control product alternatives to the grape industry. The above mentioned government agencies to work closely with other stakeholders such as OGGMB, OMAFRA, National Grape Co-op (New York) and Canadian registrants to facilitate solutions.

6.Target agency:

- Wendy Sexsmith, Pest Management Regulatory Agency
- Dr. Gilles Saindon, Director of AAFC – SCPFRC, London.
- Dr. Gary Whitfield, Director of AAFC – Harrow Research Centre
- Also forward to National Program Leader, Research Branch, AAFC

7.Oascc linkages:

- Ontario Pest Management Research and Services Committee

RECOMMENDATION #3:

1.Issue:

- Good Laboratory Practices (GLP) requirements for User Requested Minor Use Label Expansion Program (URMULE) – Lack of Resources to Conduct Residue Trials.

2.Background:

- Starting in 2001 all new crop residue studies conducted in the field and laboratory need to be conducted under GLP.
- There are only 3 private companies in Ontario that have qualified staff and certification to conduct these trials. There is not enough resource capacity to meet the demand of projects identified or those that are presently in queue at the Pest Management Regulatory Agency.
- In addition the implementation of the new GLP guidelines means more research dollars will be required to conduct these labour intensive trials as a result of increased documentation and data requirements and the need for separate residue and efficacy studies.

3.Gaps/barrriers/deficiencies:

- At present, there are no public institutions or universities that have site certification in close proximity to conduct GLP residue trials on grapes and other fruit crops.

4.Details:

- Budget allocation to cover training, staffing and equipment requirements to support grape and tree fruit minor use projects; i.e. residues for herbicides, fungicides, insecticides and miticides.
- Staff and managers continue to work with private consultants to secure certification of sites and train personnel for GLP.

- Applications and follow through needed with Standards Council of Canada for certification.

5.Recommendation:

- AAFC research branch allocate budget resources and staff to facilitate Vineland and Harrow site certification and to support GLP residue trials for grape and tree fruit minor use registration applications and projects.

6.Target agency:

- Dr. Gilles Saindon, Director of AAFC – SCPFRC, London
- Dr. Gary Whitfield, Director of AAFC – Harrow Research Centre
- Also Forward to National Program Director, Research Branch, AAFC

7.Oascc linkages:

- Ontario Pest Management Research and Services Committee
-

RECOMMENDATION #4:

1.Issue:

- It would appear that Canada is almost harmonized with the USA when it comes to review and re-registration of older pesticides eg. FQPA process and Organophosphate and Carbamate insecticides. However, having either replacement products or new pest control products lags far behind. This presents grape growers with two main problems:
    - Reduced competitiveness by not having access to new pest control products as compared to USA counterparts.
    - Loss of export market as they are unable to export finished and unprocessed wine/juice products because there are no common conventional products that can be used in both Canada and the USA for pest control (e.g. leafhoppers and grape berry moth.)
    - Similar issues will likely follow as fungicides go through a similar review process.

2. Background:

- Ontario growers have a competitive disadvantage in the world market as a result of limited access to crop protection materials, including new chemistry, biological controls and biorational or least toxic products. Wine as a processed product is especially a very competitive global market as new world producers such as Chile, Australia and South Africa increase product and have access to new pest control products.
- Ontario growers often must use older, less environmentally friendly products, because new materials are not registered. Implementation of the Food Quality Protection Act in the U.S. will mean that some older materials will no longer be available, or that produce treated with these products cannot be exported to the U.S.
- While U.S. growers have access to new products and new chemistry to replace materials that are lost, Ontario growers often do not have access to these products, or must wait years before they are registered. In some cases, costs of a Canadian registration are such that it is not economically feasible.

2.Gaps /barriers/deficiencies:

- With the difference in registration requirements companies marketing both biorationals and conventional pesticides are not applying to register new pest control products in Canada, because of additional registration and development costs which cannot be justified with the relatively small market potential in Canada.
- Relatively fewer research and development dollars are available to support minor use registrations.

4. Details:

- Changes are needed to the current registration system to move closer to harmonization of access to crop protection materials with the U.S.A., including increasing the number of crop protection products that are jointly registered.
- More emphasis must be placed on alternative products (similar to that of the EPA) which would increase the availability of and accessibility to IPM compatible materials.
- The system for the registration of biological control options must undergo significant changes to make these materials available to growers.
- Enhanced adequate funding for the URMUR and URMULE programs is also required.
- Examples of recent discrepancies in products available to U.S. competitors:
    - Admire (imidacloprid) for leafhopper control on grapes
    - Actara (thiamethoxan) for leafhopper control on grapes
    - Agrimek (abamectin) for mite control on grape
    - Sovran (kresoxim-methyl) for powdery mildew, downy mildew, blackrot disease control on grapes
    - Nutrol (Mono potassium phosphate) for powdery mildew control on grape
    - Seranade (biopesticide) for control of powdery mildew and other diseases on grape
    - Stylet oil (aliphate petroleum distillate – food grade hydrocarbon derived from oil) control of powdery mildew on grape
    - Flint (trifloxystrobin) – for control of powdery mildew, downy mildew, black rot disease on grape
- Other products under development in the USA with limited access to American growers but not available or under company development in Canada
    - Intrepid (methoxyfenozide) for control of grape berry moth on grape
    - Esteem (pyriproxyfen) for control of leafhoppers and grape berry moth on grape
    - Floramite (bifenazate) for mite control on grapes
    - Quintec (quinoxyfen) for powdery mildew control on grape

Note:

Ontario growers are very interested in IPM programs on grape and have demonstrated a willingness to work with alternative products and reduced pesticide use. In order to remain competitive they must have access to the same arsenal of pest control products that are available to U.S.A. and other global competitors.

5.Recommendation:

- PMRA improve the registration process for all crop protection materials including biologicals and biorationals.

- AAFC research and policy branch allocate budget resources and staff to facilitate data collection and compilation of minor use application packages.

6. **Target agency:**
- Wendy Sexsmith, Pest Management Regulatory Agency
- Dr. Gilles Saindon, Director of AAFC – SCPFRC, London.
- Dr. Gary Whitfield, Director of AAFC – Harrow Research Centre
- Also forward to National Program Leader, Research Branch, AAFC

7. **Oascc linkages:**
- Ontario Pest Management Research and Services Committee

GREENHOUSE FLORICULTURE

RECOMMENDATION #1.

Issue

The industry is concerned about the impact of the impending Nutrient Management Legislation and how it can participate in and take some ownership of the process.

Background

The industry is well aware of the current direction of the provincial government and the impending nutrient management legislation that will restrict the off-site movement of nutrients. There are options for individual growers to address these concerns and many growers in the industry have already taken proactive steps towards reducing or eliminating nutrient run-off. A recent survey by the University of Guelph, showed that 35% of the greenhouse production area is using recirculating systems. Despite these impressive statistics however, it still means that 65% of the industry may need to invest considerably in new technology if this needs to be done to meeting any new standards that may be developed. Growers of cut flowers in ground beds, and bedding plant growers may be most affected.

Government committees are currently evaluating available figures for nitrogen requirements of horticultural crops. The industry needs to be part of the process of development of standards.

Details

An industry-initiated committee or task force with the task of monitoring the progress of this legislation and any potential impact it may have, would be valuable in ensuring its best interests are considered. The greenhouse vegetable industry should be considered as a potential partner. The task force may also want to consider the applicability of systems such as the Dutch MPS, and whether it would have validity in the Ontario situation. The task force would need representation from the Ontario government (OMAFRA) to stay informed and to help address industry concerns.

Recommendation

It is recommended that the industry move to establish a Task Force on Environmental Standards with representation from OMAFRA. The role of the task force will be to:

- monitor progress of nutrient management legislation
- have input where appropriate into development of standards or targets for the industry
- investigate other environmental reporting systems and evaluate their suitability for Ontario

Target Agency

- Flowers Canada (Ontario), Ontario Greenhouse Vegetable Growers
- OMAFRA

RECOMMENDATION #2.

Issue

A number of issues relating to the US border have arisen in the last year. It is critical to the industry that the US border remains open to the free movement of product.

Background

The success of the Ontario floriculture industry is heavily based on its ability to compete globally and the strength of its export market. Most of the industry's production is currently exported and it has a positive trade balance with the US. With a perishable commodity such as flowers it is essential that border crossings are free of delays. Even a one day delay can compromise the quality of the product. To put the potential impact of border delays into perspective; if the Ontario chrysanthemum industry alone were shut down as a result of a real or perceived quarantine issue, it would affect an industry that is worth approximately $70million per year to the Ontario economy. In the past year, several issues have arisen that have affected (or have the potential to affect) the export sector of the industry.

- Quarantine issues such as Chrysanthemum White Rust and Sudden Oak Death
- Anti-dumping action brought by US tomato growers against Canadian growers and the concern of similar action against flower growers
- Delays for exporters of cut flower bouquets made up of product already inspected by USDA on its way into Canada
- Country-of-Origin labelling regulations that are not harmonized between the US and Canada
- External issues (e.g. terrorism)

Over-riding these concerns is the inconsistency of US inspection procedures at different ports of entry as a result of individual interpretation by USDA inspectors.

Some of these issues (e.g. terrorism), the industry acknowledges it has no control over. Others (e.g. quarantine, cut flower delays) have been the mandate of CFIA, and the industry would like to acknowledge and thank CFIA for their professional and timely handling of these issues, and their efforts to allow all interested parties to be a part of discussions where appropriate and to keep them informed of new developments.

Details

This issue encompasses several concerns, each of which on its own is capable of serious impact on the industry. There are a number of possible ways in which the issue(s) should be addressed.

- With regard to quarantine issues, there is a need for continued co-operation between CFIA, industry and other levels of government, so that there is no doubt or misunderstanding of the financial implications of export delays, or the need for rapid resolution of problems. A strong and committed government inspection agency plays a key role in resolving disputes and concerns.
- To address the potential for anti-dumping action being brought against the industry, it is essential that proactive steps be taken to lobby the US industry to remove any misconceptions they may have on the success base of the Ontario industry. Although the industry feels confident it could successfully argue against any potential allegations of dumping, nonetheless it would be prudent to consider developing reliable cost-of-production figures for major crops. Close liaison with the Ontario Greenhouse Vegetable Growers and monitoring of the greenhouse tomato anti-dumping case is critical.

Additional information useful in addressing border issues may come from a recently commissioned study by George Brinkman on tariffs affecting trade in horticultural products.

Recommendation

It is recommended that:

- The industry, in conjunction with OMAFRA (extension specialists, Economics Branch), investigates the development of cost of production figures for major greenhouse export crops.
- The industry (in collaboration with Flowers Canada-National and government agencies such AAFC-Market and Industry Services Branch, and OMAFRA-Market Development Branch) actively pursues a communication and lobbying campaign with the US industry (Society of American Florists), to improve their understanding and perceptions of our industry and how it is supported.
- The industry continues to maintain close ties with the Ontario Greenhouse Vegetable Growers and to closely monitor the anti-dumping action brought against the tomato growers.
- The Canadian Food Inspection Agency continues to support the industry in border issues falling within its mandate. Task Forces such as that created to deal with the Chrysanthemum White Rust issue, are an excellent means of keeping communication lines open, and should be looked at as a model for future issues. Priority should be given to improving communications with regional US port authorities to expedite resolution of delays and problems.

Target Agencies

- Flowers Canada (Ontario)
- Flowers Canada
- OMAFRA
- AAFC
- CFIA

OASCC LINKAGES

- Ontario Pest Management Research and Services Committee

RECOMMENDATION #3

Issue

Continued Depletion of Government and University Personnel Resources directed towards the Floriculture Industry

Background

This recommendation has been a part of the subcommittee's report for many years, but given the strength of the industry and its contributions to government through sales taxes, the committee feels the industry is under-represented in resources directed towards it. Since the mid-1990's, there has been a gradual depletion of government and university research and extension resources focusing on the floriculture industry. The subcommittee also feels that the industry should approach government marketing resources for support, in view of the industry's export markets and to discuss the potential for increasing domestic sales of product.

- The response from last year's *Recommendation* from the University of Guelph was that OHCRSC understood that the university was currently in the process of filling the faculty position left vacant with the retirement of Dr.Tsujita some years ago. The subcommittee continues to support the filling of that position as soon as possible.

- At Agriculture and Agri-Food Canada, government cutbacks in 1995 resulted in the loss of an entomology position at Vineland which was dedicated to the industry. The only permanent scientist still working on industry-related issues at AAFC, Vineland, is retiring in early 2002. The industry appreciates the MII funding that led to the establishment of four short-term projects at Vineland from 1998-2001. However, of those only one has been continued at Vineland despite a willingness from the industry to continue funding three of the original projects. Because of the priority the industry places on this work, it has continued funding one of the projects (on thrips) at the Harrow Research Station. The commitment of AAFC, Harrow and the supervising scientist is appreciated, but there are logistical problems for a research program to function as well when it is located away from the centre of the industry. The industry would also like to continue funding one other of the original projects, but has not yet come to any agreement to do so.

  The subcommittee acknowledges the AAFC response from last years' *Recommendation* on this topic. (In part "*Greenhouse insect floriculture pest management programs are being combined with greenhouse vegetable research programs at GPCRC-Harrow because of the strong convergence in the nature of greenhouse insect pest problems. Floricultural pathology problems are continuing to be addressed by a 3-yr MII program at SCPFRC-Vineland*). However, the subcommittee does not necessarily agree that there is a "…*strong convergence in the nature of greenhouse insect pest problems*". Certainly many of the pests are the same, but the *nature* of the problems is not necessarily the same. IPM research on greenhouse vegetables would be unlikely to take the same direction as research on the same pest in floriculture. The subcommittee asks the question as to whether permanent entomology resources at AAFC, Harrow will be evenly divided between the needs of the greenhouse vegetable and floriculture industries. The subcommittee also has concerns over the wisdom of geographically separating two inter-related disciplines (entomology and pathology) conducting research into the same commodity.

Floriculture pathology issues currently being "*addressed by a 3-yr MII program at SCPFRC-Vineland*) will suffer from the imminent retirement of the virologist currently working on thrips/virus/host interactions. The subcommittee hopes that this position is replaced with a permanent pathology position.

An additional concern emerging from this year's meeting was the lack of greenhouse engineering expertise within the government and university system. This was discussed with regard to **Issue #6**,*Optimisat ion of the Greenhouse Environment*. Until recently there has been an engineer position at AAFC Harrow, to support the greenhouse vegetable industry. The floriculture industry also made occasional use of that position as a resource especially where issues affected both industries. However, that position is now vacant. The industry would like to enter into discussions with the greenhouse vegetable industry and with AAFC on the replacement of the engineer position. If insect pest management for floriculture can be combined with similar research for the vegetable industry, then a cogent argument can be made for a similar merging of engineering resources.

- OMAFRA's Foodland Ontario promotes the consumption of Ontario grown produce and the industry feels it could benefit significantly from a campaign aimed at increasing domestic sales of Ontario floral products.

Recommendation
It is recommended that:

- The University of Guelph expedites the filling of the faculty position in floriculture in as timely a fashion as possible.
- AAFC devotes equal entomological resources at Harrow to both greenhouse floriculture and vegetables
- AAFC replaces the pathology position at Vineland when it becomes vacant
- AAFC discusses the replacement of the engineer position at Harrow, with both the vegetable and floriculture industries
- Flowers Canada (Ontario) enters into discussions with (OMAFRA) Foodland Ontario to discuss domestic marketing of Ontario-grown floral product

Agencies

- University of Guelph
- AAFC
- OMAFRA
- Flowers Canada (Ontario), Ontario Greenhouse Vegetable Growers

RECOMMENDATION #4

Issue
Registration of new pesticides for the industry through the minor use registration program

Background
The committee continues to express its concern over the apparent lack of commitment by PMRA to seriously address the URMUR aspects of the Minor Use Pesticide program. With industry

support in recent years, excellent progress has been made with new pesticides obtained through URMULE. However, many of the most urgent pesticide needs for the industry can only be addressed though URMUR. The committee feels that the principle behind URMUR is excellent, but that it is not being acted upon by PMRA. This view is reflected by comments made to various committee members from registrants in the US who have suggested that the process is too onerous in Canada for them to seriously pursue bringing new products into the marketplace here. With the impact of FQPA starting to be felt, the need for new products is becoming increasingly urgent. Without newer pesticides the health of workers and the environment is being compromised by the need for multiple applications of older, less effective products.

Most of the new products that the industry is seeking under this program are reduced risk (in the US), and have high compatibility with natural enemies (a major consideration in the greenhouse industry where biocontrol plays an increasingly important role in pest management). Many of the products also fall into the microbial category, often manufactured by smaller companies with limited resources. Even though registration fees are waived for such products, the URMUR program provides little incentive for these companies to become involved, since even repackaging from a US to Canadian format can be an expensive undertaking ($15000 - $25000). Efficacy requirements may also be inadequate for the more stringent regulations in Canada compared to the US.

A further concern is the need to address the gap that exists between URMULE and URMUR. There are active ingredients currently registered that are not eligible for either program. For example, an AI may be registered for a use in a formulation not suitable for that needed by the industry. URMULE cannot be used because of the formulation difference. The same AI however, may be registered in an appropriate formulation in the US, but is ineligible under URMUR because the AI is already registered in Canada.

Details

Industry concerns over pesticide use and registration should continue to be directed to all levels of government and to the PMRA.

Recommendation

It is recommended that:

PMRA make a serious commitment to minor use registration in all its aspects. PMRA should in particular address the above concerns to make the program more workable and attractive to companies with products having a novel mode of action (especially microbials). PMRA should also address the current gap existing between URMUR and URMULE, so that potential new products are not lost.

Target Agency

- Pest Management Regulatory Agency

OASCC LINKAGES

- Ontario Pest Management Research and Services Committee

RECOMMENDATION #5

Issue

There is a need for better lines of communication within the floriculture industry, but also between it and various levels of government.

Background

There is a need for more immediate communication tools that will allow information to be disseminated or exchanged at short notice. With the increased expansion and sophistication of computers, it is felt that there is an excellent opportunity to address this need. The industry is needing a communication package that would allow it to communicate in a more effective and timely fashion with:

- Other industry associations (e.g. in the US)
- Its members
- Government

There have been a number of issues recently where more rapid communication technologies would allow the industry to better serve the needs of its members. Examples of how this technology would be useful include:

- Updates by industry to growers on quarantine issues at the border or other current concerns
- Production and pest management issues where timely alerts or dissemination of information by extension specialists to growers would be valuable
- Communication between growers in discussing production concerns

Details

The industry should determine exactly what its communications needs are and how they can best be met. At that point, there should be consideration given to current communication technologies that are already in use, for example, the OMAFRA web site, the Cecil Delworth Foundation web site, or an upgraded Flowers Canada web site, to determine whether they could be used to serve its needs.

Recommendation

It is recommended that:

Flowers Canada (Ontario) conduct a review of its communication needs to determine if they can be met by existing systems, or whether they need to develop a new communication package tailored to its own needs. The review should include discussions with OMAFRA, Flowers Canada and the Cecil Delworth Foundation to determine the capabilities and limitations of their web sites.

Target Agencies

- Flowers Canada (Ontario), Flowers Canada, Cecil Delworth Foundation
- OMAFRA

GREENHOUSE & PROTECTED CROPS

RECOMMENDATION #1, directed to AAFC and OMAFRA:

WHEREAS,
There is a very limited number of products registered for the control of greenhouse vegetable pest and diseases in Canada. However, growers in other countries have access to additional effective products. Greenhouse vegetables produced in such countries are imported into Canada in unfair competition to locally produced crops.

IT IS RECOMMENDED THAT,
Increased funding and other support be provided for minor use registration of new products.

RECOMMENDATION # 2, directed to AAFC and OMAFRA:

WHEREAS,
The industry has been voluntarily implementing changes to minimize its impact on the environment. At present new legislation will require implementation at a faster rate. This coupled with the present trade issue with the US, the previous seasons high energy costs and the lower prices at the market place makes implementing these changes more difficult.

IT IS RECOMMENDED THAT:
Provide incentives to the Ontario greenhouse vegetable industry to implement environmentally sustainable production systems.

RECOMMENDATION # 3, directed to AAFC and OMAFRA:

WHEREAS,
The greenhouse vegetable industry faces a labour shortage problem year-round.

IT IS RECOMMENDED THAT:
A split-system (6 months + 6 months) is implemented in the access and management of offshore labour.

RECOMMENDATION # 4, directed to the University of Guelph:

WHEREAS,
The Pest Diagnostics Lab has been a great support to the greenhouse industry with its rapid turn-around time for diagnostics. There was an increase in the number of samples forwarded to the laboratory in 2001, and with the new virus and pest problems afflicting the industry, the committee felt that all manner of support to the laboratory must be enhanced (financial and/or personnel) to maintain the service and quality.

IT IS RECOMMENDED THAT:
Increased support be provided to the Pest Diagnostics Laboratory in Guelph.

LOW ACREAGE CROPS

RECOMMENDATION #1

Issue:
Resources to implement effective and leading-edge nutrient management programs are not available to Low Acreage and Special Crop producers. Without a financial commitment from agencies developing nutrient management legislation, low acreage and special crop producers will not be able to effectively implement adequate nutrient management plans.

Background:
The Low Acreage and Special Crops Sub-Committee certainly recognizes the need for development of detailed nutrient management profiles for each and every crop considered low acreage and special. To utilize crop nutrition inputs effectively and still maintain yield and quality, an integrated crop fertility program must be developed which takes into account crop removal data, crop uptake data and growth stage models. New recommendations may be necessary which reflect the results of new research. By implementing such research now, a proactive, detailed and responsible nutrient management plan can be developed for these crops considered low acreage and special crops.

Recommendation:
The Low Acreage and Special Crops Committee requests that OMAFRA and AAFC establish dedicated funding for research in the area of Nutrient Management specific to horticultural crops including those considered "Low Acreage and Special".

Target Agencies:
- OMAFRA
- Agriculture and Agri-Food Canada
- University of Guelph

OASCC Linkages:
Ontario Horticultural Crops Research and Services Committee

RECOMMENDATION #2

Issue:
Consumer awareness of food safety and costs associated with on-farm environmental issues pertaining to production, post-harvest produce handling and producer liability.

Background:
Consumers of all foods, domestic and imported, are becoming more and more conscious of what they consume. Food retailers, wholesalers/brokers are beginning to make it a requirement that the food product can be traced back to the source to ensure food safety. Such increased demand on the producer increases producer liability and costs of production at the same time as ever increasing incidence of pest pressure and on-farm environmental issues.

Recommendation:
In light of increased consumer concern about food safety, the Low Acreage and Special Crops Committee supports increased financial support towards research, technology transfer and integrated crop management strategies which will assure a high quality food supply. In order to offset increased cost of production as a result of mandatory safety requirements, financial assistance should be made available to the producer.

Target Agencies:

- OMAFRA, IRMB
- University of Guelph

OASCC Linkages:
Ontario Horticultural Crops Research and Services Committee
Ontario Pest Management Research and Services Committee

RECOMMENDATION #3

Issue:
A shortage of Good Laboratory Practices (GLP) compliant locations for minor use work.

Background:
Commencing 2001, all pesticide residue trials must be conducted at GLP compliant. A significant number of minor use projects are planned for horticultural crops. Field research stations supported by staff must be GLP compliant so minor use registrations can be completed for Low Acreage and Special Crops. Often minor uses are delayed by funding problems, shortage of sponsorship and extensive P.M.R.A. demands. Such delays place Ontario growers at a competitive disadvantage. The minor use system is the only mechanism available to address concerns of Low Acreage and Special Crop producers.

Recommendation:
It is recommended that the University of Guelph, Laboratory Service and Agriculture and Agri-Food Canada move immediately to certify personnel and additional field station sites as GLP compliant.

Target Agency:

- University of Guelph, Laboratory Services and Department of Plant Agriculture
- Agriculture and Agri-Food Canada, London

OASCC Linkages:
Ontario Horticultural Crops Research and Services Committee

RECOMMENDATION #4

Issue:
Inconsistencies and unreasonable time requirements for pesticides to become available for Ontario producers.

Background:
Excessive residue trial requirements, non-recognized use of crop grouping, a shortage of interest by registrants in the URMUR program and minimal interest in biopesticide control continues to put stress on the Low Acreage and Special Crop producer. Consistent and increased stable funding is required to support the efforts of researchers, extension personnel, industry and growers.

Recommendation:
A proactive system be established immediately ("an office of Canadian minor use") that could streamline, coordinate and facilitate the requirements for Low Acreage and Special Crops. Such a system would work with the PMRA to accept crop group labels and harmonize crop mapping with the USA.

Target Agencies:
- Pest Management Regulatory Agency
- Agriculture and Agri-Food Canada, London and Ottawa
- University of Guelph, Dept. of Plant Agriculture

OASCC Linkages:
Ontario Horticulture Crops Research and Services Committee.

RECOMMENDATION #5

Issue:
Questionable future of third party variety evaluation trials.

Background:
In light of extreme summer temperatures, unpredictable rainfall amounts in recent years and increased pest pressure, producers of Low Acreage and Special Crops question future availability of suitable varieties which will yield and produce quality.

Recommendation:
The variety trials for Low Acreage and Special Crops be continued and enhanced. This work is vital for Ontario producers to be competitive in the marketplace and for continued economic viability of the agri-business community.

Target Agencies:
- University of Guelph, Dept. of Plant Agriculture
- Agriculture and Agri-Food Canada, London

OASCC Linkages:
Ontario Horticulture Crops Research and Services Committee

RECOMMENDATION #6

Issue:
Peas and Beans to Sweet Corn Sub-Committee

Background:
The Low Acreage and Special Crops Committee covers a multitude of crops. Sweet Corn stands alone. Several growers of peas and beans also grow sweet corn. Sweet corn processors are also familiar with processing of peas and beans. The Low Acreage and Special Crops Committee supports inclusion of peas and beans with the sweet corn committee.

Recommendation:
That peas and beans be included as part of the Sweet Corn Research and Services Sub-Committee commencing year 2002.

Target Agencies:
- OMAFRA
- University of Guelph, Dept. of Plant Agriculture
- OASCC

NURSERY/LANDSCAPE & TURFGRASS

Title: **Development And Publication Of Nutrient Management Guidelines** **Research**

Recommendation:
The subcommittee on Nursery, Landscape and Turf recommends a concerted effort to develop and publish nutrient management guidelines for nursery, landscape and turf species.

Details:
The objective of this recommendation is to identify development and publication of nutrient management guidelines as a high priority in turfgrass and nursery production systems. The aim is to improve the ability to maintain high quality nursery, landscape and turf systems with minimum effects on ground water quality, water use, and air quality. Research should address quantification of specific nutrient requirements by crop and where appropriate by cultivar, as well as the development and publication of guidelines for nutrient application in best management practice systems.

Background:
Current efforts to reduce the potential adverse effects of fertilizer applications on water and air quality require knowledge of nutrient requirements of managed woody and herbaceous species. This information is not available for many species at the level where it can be used for nutrient management. Safe and sustainable management of these crops will require this information, particularly in the context of potential nutrient management regulation. There are important implications to water quality and quantity in use of proper nutrient management.

Title: Development Of Alternatives To Pesticides Research

Recommendation:
The subcommittee on Nursery, Landscape and Turf recommends continued support for research into alternatives to pesticides and integrated pest management in turf and nursery/landscape production, particularly the development of low risk alternatives to current pesticides.
Details:

The objective of this recommendation is identify pesticides and pest management research as a high priority in turfgrass and nursery production systems. The aim is to maintain and improve the ability to control insect, disease, and other pests in the face of increasing constraints, including, for example, the loss of organophosphate insecticides and total bans of "cosmetic" pesticide use at the municipal level. Research should address improvements in integrating pesticides into IPM programs, as well as the development and adoption of low risk alternatives to current practices.
Background:
Between the increasingly restrictive regulatory climate (e.g. municipal and federal pesticide ban initiatives), the loss of problematic chemicals such as organophosphate insecticides, the cost and slow speed of developing new chemistries for control, and difficulties in the harmonization process for pesticide registrations, there is increasing need for research into integrated pest management approaches. Monitoring methods, thresholds, and alternative low risk management methods and materials are all research areas which need to be encouraged, to ensure that the nursery/landscape and turf industries are able to continue to maintain the quality of production.

Title: Dealing With Water Quality And Quantity Problems Research

Recommendation:
The subcommittee on Nursery, Landscape and Turf recommends continued research into water use and water management in turf and nursery/landscape production, as well as education and extension of the information to the producers.

Details:
The objective of this recommendation is identify water use and water management research as a high priority in turfgrass and nursery production systems. The aim is to maintain and conserve water quantity and quality in the face of increasing constraints on both in the industry. Research should address problems with water supply (the input side) and the net effects of water use on

production and the environment (the output side). Timely extension of water use and management information to the end users is critical.

Background:
The combination of increased demand for high quality turf and landscape production, increased awareness of potential sensitivity of water systems to shortage or pollution, and long-term changes in climate and weather (including extended drought periods in 1998, 1999 and 2001 and the Walkerton water problems in 2000) have led to the identification of water use and management research as a high priority. Areas which could be addressed by this research priority include - on the input side: irrigation scheduling and delivery systems; fertigation and other injection systems; the effects of water quality on turf or nursery production; use of grey water or recycled water for irrigation; nutrient recycling; and development of low water use systems through cultivar selection or management methods. On the output side research could address runoff and leaching of nutrients or pesticides; groundwater protection; and the net effects of turf or landscape systems on the water balance in managed landscapes.

Because water problems appear to be moving from chronic to acute in many nursery and turf operations, timely and efficient transfer of information arising from this research is vital.

Title: Biology And Control Of Emerging Pests Research

Recommendation:
The subcommittee on Nursery, Landscape and Turf recommends specific research efforts into the biology and control of emerging pests, particularly those which have potential to become more important due to either long term climate change or loss of chemical control agents.

Details:
There are a number of important nursery, landscape, and turfgrass pests which have the potential to produce significant economic losses if patterns of increase continue, if controls are not developed, or if current controls are restricted (daylily rust, anthracnose basal rot, white grubs). For many of these pests the biology in Ontario conditions is not well understood, which will limit our ability to respond to increased populations.

Background:
The identification and study of pests which have the potential to become significantly more important economically is a strategic recommendation, based primarily on the appearance of a number of such pests in nursery and turfgrass production in recent years, as well as the potential effects of long-term climate change and the deregistration and restriction of pesticides (including complete bans of "cosmetic" pesticide use by municipalities).

Title: Response To The Plum Pox Virus Problem Service

Recommendation:
The subcommittee on Nursery, Landscape and Turf recommends a coordinated effort to deal with the effects of the plum pox virus problem.

Details:
The objective of this recommendation is identify as a priority a coordinated effort among producers, researchers, and regulators to deal with the plum pox virus problem. This could include efforts such as production and certification of virus free nursery stock and province-wide coordination

Background:
The effect of the plum pox virus has been significant in the nursery/ landscape industry, as crops such as sand cherry are identified as potential carriers and subject to quarantine and destruction. A coordinated effort to produce genetically resistant *Prunus* types, as well as certification of resistant or virus free material, will be important in protecting the markets for Ontario *Prunus* material.

Title: Acquisition Of Pesticide Use Data (Industry And Public) Service

Recommendation:
The subcommittee on Nursery, Landscape and Turf recommends that accurate and current data on the use of pesticides by the industry and by the general public be acquired.

Details:
Much of the current discussion about pesticide use, the relative risk/benefits of same, and efforts to restrict or ban pesticide use for "cosmetic" purposes is occurring in the absence of accurate quantitative data on the use of pesticides, particularly as used by professional applicators *vs* the general public.

Background:
Important decisions are likely to be made at the political level in the near future as to the use of pesticides for "cosmetic" purposes in nursery, landscape, and turfgrass production and management systems. These decisions will be based on information about risks and benefits of the pesticides, in terms of economic value and human and ecosystem health, but will also need to be informed with data about actual use patterns, particularly about specific pesticides and quantities used by professional applicators and the general public. This latter information is generally lacking, and is critical to the process.

Title: Coordination Of Matching Research Needs, Funding, And Researchers Service

Recommendation:
The subcommittee on Nursery, Landscape and Turf recommends an active process to match research needs with funding and researchers capable of meeting those needs.

Details And Background:
There is a perception that some of the shortcomings in the delivery of research in support of the industry may be a result of failure to match the research needs, researcher capability and research funding. This recommendation is directed towards ensuring that lack of coordination not be a

cause of failure to deliver needed research results. This may involve a more proactive approach to the matching process.

Title: Acquisition Of Current Industry Economic Data **Service**

Recommendation:
The subcommittee on Nursery, Landscape and Turf recommends that current industry economic data continue to be acquired.

Details And Background:
Statistics Canada gathers statistics on the farm gate value and averages for nursery, landscape and turf crops. Retail sales and services relating to the installation, maintenance and care of these plants are value-added components of this part of horticulture for which adequate statistics are not available. It is felt that broader market-based statistics are needed to maintain the competitive edge and to improve the market share of Ontario's nursery, landscape and turf producers. The project underway under K. Nentwig is going in the right direction, but this effort needs to be supported and maintained, so that statistics may be up-to-date and accurate.

Title: Dealing With A Chronic Labour Shortage **Service**

Recommendation:
The subcommittee on Nursery, Landscape and Turf recommends that the chronic labour shortage in the industry be identified as a problem to be addressed by appropriate agencies.

Details And Background:
In the past, the labour shortage in the industry has in part been one of trained labour. Currently this is not the case, and as such the problem cannot be addressed through education or training. While some of the problem may addressed by the forces of the free labour market, it may also be possible to effect some changes via policy, particularly as much of the labour requirement in the industry is seasonal.

Title: Educating The Regulators **Service**

Recommendation:
The subcommittee on Nursery, Landscape and Turf recommends that every effort be made to ensure that agencies with regulatory responsibility in the industry (pesticide use, water, nutrient management) are given opportunities to be educated in the state-of-the-art of the industry in the appropriate area.

Details And Background:
There is a perception in the industry that regulatory agencies are not always given adequate access to information about how the industry operates with respect to their mandated areas (pesticides, etc.) Given the importance of some of the decisions being made to the future of the industry, it is vital that every opportunity be taken to ensure that the regulators are exposed to the current practices.

POTATOES

Recommendation # 1

Issue: The potential closure of research and other facilities in Ontario.

Background: With a new contract between OMAFRA and the University of Guelph being negotiated, potential closure of research and other facilities important to the potato industry in Ontario have been discussed.

Research stations have the equipment for small plot work which is more cost effective than demonstration plots when large numbers of treatments are compared. Trial sites under stringent control are a necessary part of the good laboratory practices which are required for creditable research results. Research facilities also permit the release of pests if natural infestation is insufficient, something which cannot be done in growers' fields.
Research conducted in Ontario research facilities is crucial to develop new technologies that growers can adopt to help them remain competitive.

The Seed Potato Upgrading and Distribution (SPUD) Unit is the foundation of the Ontario seed potato program supplying producers with high quality Nuclear minitubers. This service is essential to the long-term stability of the Ontario seed potato program. As well, the SPUD Unit is involved with the OSPGA, the Potato Board and MPB Cologne in developing a molecular or biofarming industry in Ontario based on Industrial Tubers. MPB Cologne chose Ontario because of the rapid multiplication of high quality seed available through the SPUD Unit. Without this system in place rapid multiplication of new transgenic clones would not be possible in Ontario.

Recommendation: It is recommended that OMAFRA and the University of Guelph reach an agreement to maintain all the University of Guelph infrastructure and that no closures of research or other facilities occur.

Target Agency: Deb Stark, Assistant Deputy Minister, Research and Corporate Services Division, OMAFRA
Alan Wildeman, Vice-President Research, University of Guelph

OASCC Linkages: Ontario Pest Management Research and Services Committee

ROOT, BULB AND LEAFY VEGETABLE

RECOMMENDATIONS ARISING FROM THE IDENTIFIED ISSUES

There are four recommendations made by the Ontario Root, Bulb & Leafy Vegetable Research & Service Committee in 2001. They are ranked in decreasing priority as follows:

1.Loss of Nematode Research Capabilities in Ontario

2.Dedicated Funding for Nutrient Management Research

3.Modification of the Minor Use Regulatory Process

4.Certification and Maintenance of GLP-compliant Facilities.

Details of each recommendation are given below.

RECOMMENDATION NUMBER: 1

Issue: Loss of Nematode Research Capabilities in Ontario

Background:
Previously, at AAFC- Vineland there were 4 nematologists active in research. In 2002, the last nematologist in Ontario will retire. In the past, this committee was given assurances by previous directors of AAFC Southern Crop and Food Protection Research Centre that the capacity for conducting nematode research and addressing nematode concerns in this province would be maintained. The presence, introduction, and outbreaks of nematodes in Ontario vegetable crops have the potential to result in serious quarantine and trade issues, and as such it is essential that a significant nematode research program is available to support the Ontario root, bulb and leafy vegetable sector.

On several occasions in the past correct identification of nematode species was crucial to the root, bulb and leafy vegetable sector. The lack of an 'in house' nematode taxonomist at AAFC will force Ontario producers to use US resources for identification which may lead to quarantine and trade issues on exported crops.

Although there is one nematologist at AAFC - Horticulture Crops Research & Development Centre (St-Jean-sur-Richelieu), that research program focuses on nematodes of potato, corn and turf and does not address vegetable crops.

Details:
Very few nematologists are left at any AAFC locations throughout the country. Correct identification of all taxa of crop pest pests and the maintenance of a research effort is crucial for the adequate protection of root, bulb and leafy vegetables and the stability and competitiveness of the industry.

Recommendation:

The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee recommends that action be taken to ensure that the ability to conduct nematode research of relevance to vegetable growers is maintained after the retirement of Dr. John Potter.

Target Agency:
☐ G. Saindon, AAFC, Research Branch, SCPFRC, London

OASCC Linkages:

- ☐ OHCRSC

RECOMMENDATION NUMBER: 2

Issue: Dedicated Funding for Nutrient Management Research

Background:
Resources to implement effective and leading-edge nutrient management programs are not available to minor crop producers such as root, bulb and leafy vegetable producers. Without a financial commitment from the agencies developing this legislation, vegetable crop producers will not be able to effectively implement adequate nutrient management plans (NMP).

Provincial agricultural research funds are already limited and the inclusion of NMP research within existing funding programs limits the capacity for conducting research in other areas critical to vegetable producers.

Details:
The Ontario Root, Bulb & Leafy Vegetable Research and Services Committee recognizes the need for the development of detailed nutrient management profiles for all vegetable crops including root, bulb and leafy vegetable crops. To utilize crop nutrition inputs effectively and still maintain crop yields and quality an integrated crop fertility program must be developed which takes into account crop removal data, crop uptake data and growth stage models. New recommendations may be necessary which reflect the results of new research. By implementing such research now, a proactive, detailed and responsible nutrient management plan can be developed.

Given that the benefits of implementation of NMP will accrue to society as a whole and not to agricultural producers, the costs of implementing NMP should not be borne by growers.

Recommendation:
The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee requests that OMAFRA and Agriculture & Agri-Food Canada establish dedicated funding for research in the area of 'Nutrient Management Planning' specific to Ontario's horticultural crops including 'root, bulb and leafy vegetable' crops. (AAFC; OMAFRA, Research, Education, Laboratories and Risk Management Branch).

OMAFRA - University of Guelph programs are asked to give higher priority to NMP research issues in future programs (OMAFRA-University of Guelph).

In addition, the Ontario Root, Bulb & Leafy Vegetable Research & Services Committee requests that the provincial Minister of Agriculture, Food and Rural Affairs work to ensure that costs of implementing NMP legislation are not downloaded to Ontario growers, including those of root, bulb and leafy vegetable crops (Minister, OMAFRA).

Target Agency:

- ☐ OMAFRA (Research, Education, Laboratories and Risk Management Branch)
- ☐ Brian Coburn, Minister, OMAFRA
- ☐ Agriculture & Agri-Food Canada
- ☐ OMAFRA - University of Guelph Research Program

OASCC Linkages:

- ☐ OHCRSC

RECOMMENDATION NUMBER: 3

Issue: Modification of the Minor Use Regulatory Process

Background:
Despite recent activities of both PMRA and EPA to 'harmonize' regulatory processes, at the grower level there remains a major discrepancy between Canadian and US growers with regard to access to effective, reduced risk, biopesticide and seed treatment pest control options.

The impacts of FQPA (USA) and re-evaluation (Canada) decisions are far greater for Canadian growers because of a lack of access to alternative replacement products.

The cost for research institutions to become GLP compliant and maintain this compliance is far beyond what the minor use program can sustain. If research institutions that the minor crops industry relies upon for residue studies continue to lose money, they will be lost.

Details:
Despite recent efforts towards joint reviews, supposed 'biopesticide' harmonization, proposals for seed treatment harmonization and current URMULE and URMUR programs, the reality for growers is that there is virtually no harmonization with US growers. Excessive residue trial requirements in both Ontario and Quebec, lack of use of crop groupings, poor interest by registrants in the URMUR program and lack of access to reduced risk, biopesticide and seed treatment pest control options continue to put unnecessary pressure on already struggling minor crop producers.

Researchers, extension personnel, industry and grower cooperators require adequate, consistent and stable funding to ensure completion of requirements under the minor use system. More flexibility with regard to funding minor use projects is required and more communication with the sponsors of minor use projects is needed.

Recommendation:
The removal of the crop residue subzones 5B, 7A, and 1A must occur if progress towards minor use is to be achieved. (PMRA)

The application of crop group labels for registration of safe and effective crop protection materials is necessary (PMRA)

True harmonization of data requirements for seed treatment registrations is necessary so that minor crop growers have access to this excellent risk reduction strategy. (PMRA)

The use of the US 'reduced risk' classification on minor use submissions for products that are classified as such in the USA is necessary. (PMRA)

The use of a more inclusive 'biopesticides' category in Canada is also necessary so that growers have equal access to these risk reduction tools. (PMRA)

A more responsive and cost-effective URMUR program is needed to secure access to many products currently only available to US producers. Registrants, sponsors and PMRA need to work closely together on each URMUR submission. (PMRA and CropLife Canada)

When funding is approved for URMULE projects, researchers should be able to request an advance on the approved funds so that research can be initiated in a more cost-effective manner (AAFC)

AAFC should set aside funding to establish an "office of Canadian minor use" that could coordinate and facilitate the needs of all minor crops commodities in Canada. The concept of an "IR-4 North" coordinating office which can provide study directorship to minor use projects is recommended. (AAFC, Policy Branch)

Target Agency:

- ☐ PMRA, Health Canada- D. Chaput, Health Canada, Pest Management Regulatory Agency
- ☐ V. Sorenson, Crop Life Canada
- ☐ B. Boddis, AAFC, Policy Branch
- ☐ J. O'Sullivan, OMAFRA-University of Guelph, Plants Program
- ☐ G. Saindon, AAFC, Research Branch, SCPFRC, London
- ☐ G. Dorrel, ADM, AAFC, Research Branch, Ottawa

OASCC Linkages:

- ☐ OPMRSC

RECOMMENDATION NUMBER: 4

Issue: Certification and Maintenance of GLP-compliant facilities

Background:
As of 2001, all pesticide residue trials have to be conducted in compliance with Good Laboratory Practices (GLP). A large number of minor use projects are proceeding or being planned for vegetable crops in the coming years. If the field stations and personnel that the root, bulb and leafy vegetable sector relies upon to conduct these trials are not GLP compliant, trials cannot proceed and many minor use registrations may not be completed. In addition, the lack of GLP-certified analytical laboratories in Ontario greatly impedes the progress and completion of minor use projects and submissions to PMRA. Most minor uses are already delayed by funding problems and other PMRA requirements. In light of the US FQPA and several serious pest management problems in Ontario vegetable crops, the minor use system is the only mechanism available to address grower's concerns and the sustainability of the industry.

There are considerable costs involved in maintaining the GLP-certification of personnel at these facilities. These costs cannot be covered under existing funding programs for minor use research projects. For research institutions to consider GLP compliance or to maintain GLP compliance a stable financial commitment is required so that minor use projects can be completed in a cost-effective manner.

Details:
There are considerable costs involved in maintaining the GLP-certification of personnel at these facilities. These costs cannot be covered under existing funding programs for minor use research projects. For research institutions to consider GLP compliance or to maintain GLP compliance a stable financial commitment is required so that minor use projects can be completed in a cost-effective manner.

Recommendation:
It is strongly recommended that both the University of Guelph (Ridgetown) and Agriculture & Agri-Food Canada (Delhi & Vineland) act promptly to certify personnel, field station sites and laboratory facilities as GLP compliant. (U of G; OMAFRA-U of G; AAFC-SCPFRC)

Stable funding is needed from the University of Guelph and AAFC to provide base support to research facilities who have invested in GLP compliance in order that GLP-certifications are maintained (U of G; OMAFRA-U of G; AAFC - Research Branch)

Target Agency:
- ☐ G. Saindon, Director, AAFC, Research Branch, SCPFRC, London
- ☐ C. Swanton, Chair, Department of Plant Agriculture, University of Guelph
- ☐ M. Sears, Chair, Department of Environmental Biology, University of Guelph
- ☐ OMAFRA-University of Guelph Research Program

OASCC Linkages:
- ☐ OHCRSC and OPMRSC

SUMMARY OF DISTRIBUTION OF RECOMMENDATIONS

Recommendation	AAFC	ARIO	CC	CARC	OMAFRA	Other
1. Nematode Research	X					
2. Nutrient Management Funding	X				X	OMAFRA-UofG Research Program.
3. Minor Use	X					PMRA; OMAFRA-UofG Plants Program; Crop Life Canada.
4. GLP certification	X					Univ. of Guelph; OMAFRA-UofG Plants Program.

SWEET CORN

RECOMMENDATION NUMBER: 1

Issue: The Sweet Corn Research and Services Sub-committee would like to see the re-allocation of funding to support the research required to support the needs of nutrient management planning legislation

OASCC Linkage: OSMRSC

Target agency: OMAFRA, MOE, AAFC, U of G

Title: Increase funding to support nutrient research in order to meet the requirements of the nutrient management planning legislation.

Details: The funding presently available for nutrient management research (eg: New Directions Agri-food and Rural Research Program) will not inadequately fund all the required research needed to meet the requirements under the nutrient management planning legislation. Additional funding is needed to meet the needs of this legislation.

Background: Nutrient management planning requires information on crop nutrient response rates, crop uptake and utilization rates, and the fate of excess nutrients in the soil, to name a few. Coupled with the data required on a range of soil types and environmental conditions over several years, and the impact of manures, organic soil amendments, fertigation, and split applications on nutrient fate, a considerable amount of information needs to be collected. It is felt that the present matching funds provided by the New Directions in Agri-food and Rural Research Program are not adequate to fund this research.

RECOMMENDATION NUMBER: 2

Issue:. Lack of harmonization of pesticides between Canada and the U.S.. Limited funding for URMULE AND URMUR.

OASCC Linkage: OPMRSC

Target Agency: PMRA, AAFC, OMAFRA

Title: Minor use funding and coordination.

Details: The Sweet Corn Research and Services Sub-committee encourages the PMRA and OMAFRA to continue to work with the EPA and IR4 in order to reduce inconsistencies in availability of pesticides between Ontario and US producers, and recommends that funding available to the minor use registration process be increased to allow more products to move through the system

Background: Ontario growers continue to feel that they are at a disadvantage in terms of the availability of pesticides compared to U.S. producers. While there are still inequities, improvements are being made in coordinating the efforts of the PMRA and IR4. While this effort is recognized, there is a lot of work which needs to be done.

Compared to our U.S. counterparts, funding for new URMULE and URMUR's is limited. This is perceived as a limitation to the number and the speed at which new products can move through the system and creates disadvantages to Ontario growers who do not have access to the same number of products.

Overall, a system needs to be in place which will allow rapid evaluation and registration of new pesticide products. This is especially important when pesticides are deregulated, and new pest problems emerge.

RECOMMENDATION NUMBER: 3

Issue:. Claims of bee kills caused by applications of insecticides on sweet corn fields.

OASCC Linkage: Ontario Apiculture and Pollination Research and Services Sub-committee

Target Agency: OMAFRA

Title: Encourage the Ontario Apiculture and Pollination Research and Services Sub-committee to include research on bee kills in relation to the sweet corn industry as a research issue.
Details: The Sweet Corn Research and Services Sub-committee recognizes the concerns of the apiculture industry regarding bee kills and possible connection to the sweet corn industry. However, in order to facilitate research in this area, they are encouraged to include this issue, as the Sweet Corn Research and Service Sub-committee has done, as a research issue in their OHCRSC report.

Background: Discussions have been ongoing for a number of years regarding the impact of insecticides used in sweet corn on bees. In order for promote research in this area, it is advantageous to have the issue recognized as a research issue in commodity report to the Ontario Horticulture Crops Research and Services Committee.

TENDER FRUIT

Recommendation 1:
The TFRSSC recommends that, as part of a coordinated effort to eradicate plum pox virus in stone fruits in Ontario, research initiatives emphasizing the horticultural aspects of the disease are needed.

Background:
The tender fruit industry in Ontario is economically prosperous. The processing industry requires an additional 6000 tonnes of peaches to meet needs for raw product To produce this,

approximately 500,000 trees on 1800 hectares of additional land are required. New orchards outside the traditional production area will be planted in the most favoured climates north of Lake Erie. The discovery of the strain D of plum pox virus (PPV) in June 2000 changed the ability of the Ontario tender fruit industry to continue to produce susceptible crops competitively. Removal of infected trees, and those trees immediately adjacent to them eliminated 12,476 trees in 2000 and an additional 11,295 trees in 2001. Over 75 percent of the trees removed were processing varieties. A research program is needed to allow the tender fruit industry to succeed.

The following priorities emphasize the horticultural aspects of the disease, such as breeding, physiology, and cultural management.

Part 1. Tree Physiological Research Leading Toward Better Management Practices for Stone Fruit Orchards

Objective 1.1. To measure the effect of PPV on the productivity and quality of fruit.
More information is required on the effects of PPV on the varieties and species most widely grown in Ontario. Research to specifically quantify the short-term and long-term effects of PPV on tree establishment, productivity and tree health, in conjunction with the PPV titre within infected plants, is warranted.

Objective 1.2. To develop improved methods for sustainable production of stone fruits both within and beyond traditional production areas.

New orchards should be established using the newest cultivars and most advanced technology for production in northern climates. Examples of this technology include new orchard training systems, advanced irrigation systems, utilization of new rootstocks, improved mineral nutrition and advances in plant bio-substances such as gibberellins to regulate flowering and fruiting to minimize hand thinning.

Part 2. Evaluation and Improvement of Germplasm Resources with Immunity or High Levels of Resistance to Plum Pox Virus.

Objective 2.1. To develop procedures to accurately certify that plant tissues from mother blocks are indeed free of plum pox virus.

Clean nursery trees free of plum pox virus must be planted in a PPV eradication program The industry has proposed a nursery certification program for the nursery trees propagation, so only clean trees will be produced. To accomplish this goal, procedures used to test mother blocks for the presence of the virus must be accurate and reliable.

Objective 2.2. To determine the resistance of existing domestic germplasm to PPV.

Detailed information on resistance or tolerance is needed. This can best be achieved through collaborations with European institutions located where the disease is present.

Objective 2.3. To identify and import *Prunus* genetic resources with high degrees of resistance or immunity to plum pox virus for use in a breeding program

A scientist should travel to selected research stations to review candidate clones and determine the germplasm to be imported through the Centre for Plant Health in Sidney, B.C. Such germplasm will be evaluated for potential use by Ontario growers and usefulness in a breeding program.

Objective 2.4. To develop *Prunus* genetic resources immune to plum pox virus and suitable for northern climates.

A comprehensive breeding program is needed to develop cultivars through traditional breeding programs using highly resistant germplasm currently available. Immune clones may be developed through biotechnology, thus taking advantage of potential immunity genes as they become available from biotechnology research at locations such as AAFC-London, USDA/ARS-Kearneysville, W.V., USA and in Europe.

Recommendation 2:
The TFRSSC recommends that the University of Guelph, Department of Plant Agriculture, complete the staffing of the stone fruit breeding position at Vineland Station

Background:
Currently, the strength of the tender fruit industry in Ontario has come from the new cultivars developed from Vineland breeding programs and the local recommendations from research for best management practices for Ontario conditions. It is important to the growers and the entire industry to have the stone fruit breeder position filled as a research and teaching position, and also to continue to interact with both industry and extension. This is a revision and re-submission of TFRSSC recommendation 2000-2 (OHCRSC 62)

Details:
Dr. Swanton, Chair, Department of Plant Agriculture, University of Guelph, has indicated that the breeding position is in the process of being staffed. TFRSSC is resubmitting this recommendation to ensure that the position is staffed in 2002.

Recommendation 3:
The TFRSSC recommends that that PMRA improve the registration process for crop protection materials including biologicals and biorationals.

Details:
Changes are needed to the current registration system to move closer to harmonization of access to crop protection materials with the U.S., including increasing the number of crop protection products that are jointly registered. More emphasis must be placed on alternative products (similar to that of the EPA) which would increase the availability of and accessibility to IPM compatible materials. The system for the registration of biological control options must undergo

significant changes to make these materials available to growers. Adequate funding for the URMUR and URMULE programs is a requirement.

Background:
Ontario growers have a competitive disadvantage in the world market as a result of limited access to crop protection materials, including new chemistry, biological controls and biorational or least toxic products. Ontario growers often must use older, less environmentally friendly products, because new materials are not registered. Implementation of the Food Quality Protection Act in the U.S. will mean that some older materials will no longer be available, or that produce treated with these products cannot be exported to the U.S. While U.S. growers have access to new products and new chemistry to replace materials that are lost, Ontario growers often do not have access to these, or must wait years before these products are registered. In some cases, costs of a Canadian registration are such that it is not economically feasible.

Examples of recent discrepancies in products available to U.S. competitors:

- Indar (fenbuconazole) for brown rot control on tender fruit, and black knot control on plum and cherry
- Bravo (chlorothalanil) for black knot control on plum and cherry
- Elevate (fenhexamid) for brown rot control on tender fruit
- Streptomycin for control of fire blight
- Surround (kaolin clay) for pear psylla control
- Success (spinosad) for pear psylla control

Ontario growers are very interested in IPM programs on tender fruit and have demonstrated a willingness to work with alternative products and reduced pesticide use. In order to remain competitive they must have access to the same arsenal of pest control products that are available to U.S. and other global competitors.

Recommendation 4:
The TFRSSC recommends that AAFC-Vineland continue to provide crop protection research and support to the tender fruit industry by the timely staffing of positions in entomology, pathology and nematology.

Background:
The TFRSSC is concerned about the apparent erosion of research support in crop protection at AAFC-Vineland Station. Competitions have been held for the Entomology and Pathology positions, but staffing has not been completed. The Nematology position will become open when J. Potter retires in early 2002. The TFRSSC recognizes and appreciates that some resources have been diverted specifically towards plum pox research. However, the TFRSSC recommends that staffing action be initiated and completed so that vacant positions in entomology and pathology are filled prior to the 2002 growing season. This is a revision and resubmission of TFRSSC Recommendation 2000-8 (OHCRSC 68)

Details:
Growers rely on research and recommendations for control of pests, diseases and nematodes in

order to maintain a high level of fruit production. Several pests and diseases have been identified by TFRSSC, and IPM of pests and diseases is included in the research priorities of this committee. Alternative control measures are required as the industry faces review of currently registered materials

TOMATOES

Recommendation 1. Access to Crop Protection Materials/Minor Use Registrations.

Issue:
Improved access to newer, safer, more environmentally friendly and biocontrol materials through the URMULE and URMUR programs is required.
Background:
The industry continues to have difficulties with situations where pesticides are registered in the U.S. but not registered in Canada. Canadian growers are often denied (or delayed) access to newer, safer, more target specific, more environmentally friendly and biocontrol materials. Imported food produce from the US is often treated with the products denied to Canadian farmers. The US EPA has committed to deregister pest control products only if suitable alternative control products or measures are available. PMRA has no such policy, therefore, pest control products may disappear in Canada with no suitable alternate control methods in place.
Recommendation:
It is recommended that:

- Equal access to new pest control products available in the US be provided to Canadian growers and this can be accomplished with shared registration and residue levels set at the same time and at the same levels as the US. Canada still has a number of registration requirements unique to Canada which increases the cost of Canadian registrations, slows the process and often results in denial of access to products in Canada (Health Canada, PMRA).
- The registration process be speeded up so that Canadian farmers have access to the newer products at the same time as their US counterparts (Health Canada, PMRA).
- An office for minor use be established in Canada to expedite minor use registrations in Canada (AAFC and Health Canada).
- Adequate funding for the URMULE and URMUR programs be provided. AAFC should continue to fund projects at the 75% level. It is also suggested that OMAFRA split the remaining cost with grower commodity groups (AAFC, Policy Branch and OMAFRA).
- AAFC and the University of Guelph provide GLP compliant facilities to ensure that residue and other data development work required to support the minor use program may be carried out (AAFC Research Facilities in Ontario and University of Guelph).

Target Agencies:
Direct to Health Canada, PMRA; AAFC, Policy Branch; OMAFRA; and AAFC and University of Guelph research facilities in Ontario.

OASCC Linkages:
Ontario Pest Management Research and Services Committee

APPENDIX

2001 Research Priorities for OHCRSC Subcommittees

Titles only - for full details on the priorities refer to the OASCC website.

http://www.gov.on.ca/OMAFRA/english/research/OASCC_01/priorities/hort/index.html

AGROFORESTRY

PRIORITY GROUPING "A"

Issue #1: Importance of Agroforestry Research at the University of Guelph in Helping Meet Environmental Management Objectives.

Issue #2: Registration of Insecticides for Tree Nut Orchards

Issue #3: Registration of Herbicides for the Christmas Tree Industry

Issue #4: Approved and Safe Use of Chemicals in the Production of Maple Syrup

Issue #5: Development and Use of the Health Spout in Ontario's Sugar Bushes

Issue #6: Producing High Quality Maple Syrup and Maintaining it in Storage.

Issue #7: Determining the Nutrient Status of Maple Pure Maple Syrup

Issue #8: Summary of Research Findings: Sugar Bush Management

Issue #9: Need to Continue Aspects of Ice Storm Recovery Research in Ontario

PRIORITY GROUPING "B"

Issue #1: Vegetative Propagation of Maple Sweet Trees

Issue #2: Investigation of a Vapour Compression System for syrup Production

Issue # 3: Intercropping Focus

Issue #4: Need for Improved Understanding of the Relationship between Trees and Farm Drainage.

APICULTURE AND POLLINATION

A – Apiculture Issues

1: A Sustainable Applied Research/Tech Transfer Position for Apiculture.

2: Development of Varroa Mite-Resistant Bee Stocks Using Different Selection Approaches and Integrating Resistance into Ontario Tracheal Mite-Resistant Existing Bee Stocks.

3: Further Development of an Effective Integrated Pest Management (IPM) Program for Controlling Parasitic Mites Small Hive Beetles and Infectious Diseases of Honey Bees.

4: Concern over how Imidocloprid affects honey bees

5: Quality of Hive Products to Meet Consumers Expectations.

6: Maintenance of the Apicultural Regulatory and Extension Programs in Ontario.

7: Registration of CheckMite™ (Coumaphos).

8: Federal Registration of Formic Acid Mite-Away.

9: Monitoring for Varroa Resistance to Apistan®.

10: Registration of Tylosin and Lincomycin

11: Continued support for the ban on the importation of honey bees to Canada from mainland United States.

B – Pollination Issues

1: Management Strategy for Machine Harvested Cucumbers.

2: Pollination Requirements of New Varieties of Apples.

3: Produce a Best Management Practice Strategy for Pollination Management.

4:_The importance of actively encouraging education and research on alternative pollinators.

APPLE

Sustainable I.P.M. Systems
1.Fireblight strategies with impending loss of Streptomycin
2.New and Emerging Pests (OFM, OBLR, Dogwood Borer, Sawfly)

3.Alternatives to Organo phosphorus and Carbamate insecticides
4.Resistance Management of Insect pests
5.Disease Management Strategies

Post Harvest Strategies for Quality and Safety Assurance

1.Disease Control, Fungicide Resistance
2.Storage Technology, 1-MCP

Production Management

1.Cultivars
2.Thinning and Growth Regulators
3.Rootstocks and systems
4.Nutrient Management

BERRY CROPS

1. Develop sustainable crop production systems for berry crops in Ontario through breeding (long-term) and applied research (shorter-term) programs:

- Develop integrated weed control strategies for reduced pesticide use and crop losses in strawberries and raspberries.
- Breed and select new strawberry and raspberry cultivars with improved quality, yield and pest resistance.
- Develop nutrient recommendations for macro- and micro-nutrients of berry crops under different production and irrigation systems. The first priority should be the uptake and removal of nitrogen and then phosphorous.
- Develop extended-season cropping systems for strawberries and raspberries including new varieties, plasticulture, dayneutrals, greenhouses, etc.
- Develop integrated pest management options for strawberry and raspberry diseases and insect pests including the following on strawberries - anthracnose fruit rot, tarnished plant bug, 2-spotted spider mite, cyclamen mite, angular leaf spot, and root weevil, and the following on raspberries - cane diseases and fruit rots.
- Develop virus detection methods and determine the incidence of virus diseases in strawberries and raspberries in Ontario.
- Develop biological mite control strategies for raspberries.
- Determine economic thresholds for the control of foliar diseases of strawberries (ie leaf scorch, leaf blight and powdery mildew).
- Develop effective, cost-efficient bird control strategies for blueberries.

2. Examine physiological and economic potential of new or non-commercial berry crops.

CRUCIFER CROPS

1.Minor Use Registrations
2.Development of Pest Control Strategies
3.Nutrient Management
4.Specialty Crucifer Crops
5.Variety evaluation

GINSENG

1.Identification and control of root and seed diseases and rusty root:
2.The Development of Production Protocols to address water use in ginseng as it relates to irrigation for cooling and to increase soil moisture; the use of nutrients in ginseng production to address nitrogen uptake and removal, the use of manure in the preplant year, the balance of macronutrients and use of micronutrients:
3.Market Development:
4.Clinical research trials and associated production needs:
5.Germplasm research:

GRAPE AND WINE

1. Development of Advanced Integrated Pest Management Tools
    - Evaluate alternative pest control products to replace organophosphate and carbamate insecticides, as well as, fungicides that may be lost
    - Conduct Good Laboratory Practices (GLP) residue trials to support minor use registration applications for pesticides
    - Support GLP and efficacy trials to support minor use herbicide applications for vineyards
    - Develop and validate predictive-risk management models
    - Develop efficient and rapid monitoring methods for pests
    - Develop economic action thresholds for insect and mite pests
    - Develop appropriate resistance management strategies

2.Vineyard Management to Minimize Vine Stress and Maximize Productivity and Quality
    - Soil amendments and crop nutrition.
    - Research to support appropriate guidelines for Nutrient Management Plans
    - Training and other cultural practices to regulate vigour while maximizing productivity and fruit quality.
    - Determine parameters and need for irrigation while assuring food quality assurance
    - Application of precision agriculture e.g. GPS/GIS to support various disciplines and helping growers make better decisions.

- Mechanization of vineyard operations and reduce labour costs where possible.

3.Fruit Quality and Factors Affecting Wine Quality and Acceptance
- Marketing and consumer preferences.
- Aroma and flavour profiles as influenced by terroir, fermentation etc.
- Improved vintner methods for ice wine product.
- Yeast and bacterial metabolism in the fermentation and wine making process.
- Colour stability.

4.Variety, Clone and Rootstock Evaluation
- Vinifera grapes most important.
- Secondarily fresh market grapes.

GREENHOUSE FLORICULTURE

1.Integration of Nutrient, Water and Disease Management Strategies from an Environmental Perspective
2.Border Issues
3.Development of Improved Floricultural Crops and Production Techniques
4.Post Harvest Handling and Shelf-Life Issues with Potted and Cut Flower Crops
5.Development and Implementation of IPM programs in Floriculture
6.Optimisation of the Greenhouse Environment
7.Communication

GREENHOUSE VEGETABLE AND PROTECTED CROPS

GREENHOUSE VEGETABLES

1.Evaluate new and old pest and virus control measures (including application methods) and implement IPM strategies in all vegetables.
2.Develop and evaluate energy use and environmental strategies that optimize plant growth, productivity, and fruit quality, as well as integrated pest management techniques in greenhouse vegetables.
3.Development of strategies and new biological control agents, for improving control of new and old pests that disrupt IPM programs.
4.Maintain research on soilless culture with emphasis on recycling nutrient solutions and disease management to improve profitability and sustainability. Also, develop strategies to manage greenhouse waste (growing media, plant material, nutrient solution, plastic etc.) and to ensure the sustainability of the greenhouse industry.
5.Investigate the potential for the use of disinfectants as protectans against diseases, particularly bacterial and fungal diseases. Also, Identify sites and form of dormant stages of

bacterial and fungal pathogens in order to effect rational control between crops with disinfectants and modification of cultural practices.
6.Evaluate new types of crops, cultivars, and post-harvest technology procedures (including packaging and labelling) to optimize yield and fruit quality.
7.Investigate strategies to reduce efficiency of insects as vectors of plant diseases.
8.Test the efficacy of fungicides and disinfectants against fungi.

Commercial mushrooms - Long term priorities (2 to 4 years duration)
1.Compost odour management
2.Improvement of mushroom quality
3.Influence of mushroom farming practices on surface and underground water
4.Development of disease resistant mushroom strains
5.Further studies in the use of biofilters
6.Indoor Phase I building designs
7.Management of Green mold and Verticillium diseases
8.Enhancement of value to mushrooms, e.g. nutriceuticals
Short term priorities (within two years)

Insect and Disease
1.Determine the effectiveness of fungicides, fungi static materials and barrier techniques to manage Trichoderma green mould on the casing and in the compost.
2.Provide the necessary information required by AAFC for registration of products already registered in the USA and Europe.
3.Develop biological control agents against mushroom diseases
4.Determine factors that contribute to an airborne Trichoderma green mould infection.
5.Determine post-crop temperatures and post-harvest management procedures necessary to eradicate a Trichoderma green mould infection.

Production
1.Determine the effect of water quality on mushrooms.
2.Develop criteria for the "best" casing soil, e.g. black peat, sugarbeet lime, flour lime.
3.Develop methods to achieve "whiter" mushrooms before or after harvest.
4.Pinpoint the most probable procedures or materials used during Phase I composting that produces offensive odours.
5.Determine influence of straw cultivars, poultry litter bedding, feed additives, ammonia suppressants and pesticide residues on composting, mushroom production and human health
6.Prepare a literature review of the nutritional benefit of mushrooms

Specialty mushrooms- Long term priorities (2 to 4 years duration)
1. Develop "best practices" procedures for packaging and storage of specialty mushrooms to improve the shelf life and quality at the retail store level.
Short term priorities (within two years)
Insects and diseases
1. Develop strains resistant to diseases

LOW ACREAGE AND SPECIALTY CROPS

1.Nutrient Management information gaps, and plan implementation costs.
2.Post harvest strategies to ensure food safety.
3.Minor use limitations.
4.Good lab practice (GLP) compliance.
5.Acceptance of Genetically Modified Organisms (GMO).

NURSERY, TURF AND LANDSCAPE

1.Development and publication of nutrient management guidelines (Research)
2.Development of alternatives to pesticides (Research)
3.Dealing with water quality and quantity problems (Research)
4.Biology and control of emerging pests (Research)
5.Response to the plum pox virus problem (Service)
6.Acquisition of pesticide use data (industry and public) (Service)
7.Coordination of matching research needs, funding, and researchers (Service)
8.Acquisition of current industry economic data (Service)
9.Dealing with a chronic labour shortage (Service)
10. Educating the regulators (Service)

POTATO

1.Potato Productivity: Nutrient Management, Irrigation and Soil Improvement

2.Control of Soil and Seed Borne Diseases

3.Evaluation of New Varieties for the Ontario Market

4.Post Harvest Research

5.Integrated Pest Management and Insecticide Resistance Monitoring

6.Greenhouse Minituber Production at the Spud Unit

ROOT, BULB AND LEAFY VEGETABLES

1. Minor Use Pesticide Registrations
2. Crop Fertility Issues.
3. Disease Management
4. Integrated Insect and Nematode Management.
5. Development of Integrated Weed Management Programs.
6. Value-added Product Development.
7. Cultivar Evaluations.

SWEET CORN

1. Pest Management

2. Nutrient Management

3. Crop Culture

TENDER FRUIT

1. Breeding and germplasm improvement for resistance to pests, diseases and abiotic stresses
2. IPM for pests and diseases - include FQPA considerations
3. Orchard Physiology and Management
4. Post-harvest and fruit quality
5. By-products and alternative markets

TOMATO

	ORDER OF PRIORITY	
ISSUE	PROCESSING	FRESH MARKET
Breeding and Cultivar Development	1	5
Access to Crop Protection Materials/Minor Use Registrations	2	1
Pest Management in Fresh and Processing Tomatoes	3	2
Crop Water Management Through Irrigation and Fertigation	4	3
Nutrient Management	5	4
Availability of Suitable Land and Land Selection	6	6

SUMMARY OF OHCRSC SUBCOMMITTEE RECOMMENDATIONS

Titles of Recommendations only.
Detailed recommendations are listed in Recommendations starting on section pg. 260

BERRY CROPS

ISSUE: Continued Support for the Ontario Berry Crop Plant Propagation Program
It is recommended OMAFRA and the University of Guelph maintain the infrastructure at the SPUD Unit in New Liskeard and the Department of Plant Agriculture in Vineland, and that the support of a virologist be made available to the plant propagation program by AAFC.

Response discussed at OHCRSC (The subcommittee chair can follow up with other agencies identified in the recommendation for response):

AAFC Response provided by G. Whitfield:
This has been discussed with the industry in March 2001. This is a value-added service , but not a research problem within the mandate of the federal government.

ISSUE: Continuity of Nematology Research
It is recommended that AAFC fill the nematologist research position at the Vineland facility of the Southern Crop Protection and Food Research Centre

Response discussed at OHCRSC:
AAFC Response provided by G. Whitfield:
The Berry Committee chair can forward this recommendation to Gilles Saindon, AAFC. This need will be brought through the new team structure that will be in place April 2002 within AAFC.

ISSUE: Nutrient Management
It is recommended that any fertility recommendations for crops in the guidelines and regulations of the proposed Nutrient Management Act be based on valid research applicable to Ontario.

Response discussed at OHCRSC:
As there were multiple subcomittees that have made recommendations pertaining to nutrient management, the OHCRSC chair will work with the subcommittees to coordinate a response with the agencies involved.

CRUCIFER CROPS

ISSUE: Cabbage Maggot
In light of the urgent need for the rutabaga industry to address an increasing problem with cabbage maggot control options, the OCCRSC recommends to Agriculture and Agri-Food Canada Research Branch, London and to University of Guelph's Ridgetown College that a

comprehensive research program be implemented for cabbage maggot management on rutabagas. Recognizing the response received to this recommendation in 2001, the OCCRSC wishes to see a clear and concise research plan put into place in 2002.

Response discussed at OHCRSC :
All pest management priorities have been forwarded to the Ontario Pest Management Research and Services Committee.
AAFC London Response provided by Jeff Tolman : The staff resources are not available at this time and there aren't candidate materials available for testing.

ISSUE: Minor Use System

The removal of the crop residue subzones 5B, 7A, and 1A must occur if progress towards minor use is to be achieved. (PMRA)

The application of crop group labels for registration of safe and effective crop protection materials is necessary (PMRA)

True harmonization of data requirements for seed treatment registrations is necessary so that minor crop growers have access to this excellent risk reduction strategy. (PMRA)

The use of the US 'reduced risk' classification on minor use submissions for products that are classified as such in the USA is necessary. (PMRA)

The use of a more inclusive 'biopesticides' category in Canada is also necessary so that growers have equal access to these risk reduction tools. (PMRA)

A more responsive and cost-effective URMUR program is needed to secure access to many products currently only available to US producers. Registrants, sponsors and PMRA need to work closely together on each URMUR submission. (PMRA and CropLife Canada)

When funding is approved for URMULE projects, researchers should be able to request an advance on the approved funds so that research can be initiated in a more cost-effective manner (AAFC)

Stable funding is needed from the University of Guelph and AAFC to provide base support to research facilities who have invested in GLP compliance. (U. of G., AAFC, Research Branch)

AAFC should set aside funding to establish an "office of Canadian minor use" that could coordinate and facilitate the needs of all minor crops commodities in Canada. The concept of an "IR-4 North" coordinating office which can provide study directorship to minor use projects is recommended. (AAFC, Policy Branch)

Response discussed at OHCRSC:
All pest management priorities have been forwarded to OPMRSC.

ISSUE: Funding for Pest Management Research

In light of the success of the Food Systems 2002 program to date, this committee wishes to convey to OMAFRA and University of Guelph the need to continue support towards research which accomplishes the goals and philosophy of the FS2002 program. The goal of improved integrated vegetable crop management strategies leading to high quality food supplies requires a long-term and dedicated commitment. The OCCRSC wishes to request that annual funding for any new FS2002-like programs be returned to the $800,000.00 level.

Response discussed at OHCRSC:

All pest management priorities have been forward to OPMRSC.

ISSUE: Funding for Nutrient Management Research

The Ontario Crucifer Crops Research & Services Committee requests that OMAFRA and Agriculture & Agri-Food Canada establish dedicated funding for research in the area of 'Nutrient Management Planning' specific to Ontario's horticultural crops including 'crucifer' crops.

Response discussed at OHCRSC:

As there were multiple subcomittees that have made recommendations pertaining to nutrient management, the OHCRSC chair will work with the subcommittees to coordinate a response with the agencies involved.

ISSUE: GLP

It is recommended that the University of Guelph, Ridgetown and Agriculture & Agri-Food Canada (Delhi, Vineland, St. Jean sur Richelieu) move to certify personnel and field station sites as GLP compliant in time for the 2002 growing season

Response discussed at OHCRSC

All pest management priorities have been forwarded to OPMRSC.
The OHCRSC has agreed to work with OPMRSC to form a working group to pursue further discussion amongst personnel within OMAFRA, University of Guelph and Agriculture and Agri-Food Canada to look for ways to enhance coordination of GLP efforts in the province.

GINSENG

1.Fe deral funding of research on Natural Health Products.

c) That funding provided by the Office of Natural Health Products for the study or analysis of herbs includes the species of selected herb that is produced or wildcrafted in this country.
d) That funding be provided by the Office of Natural Health Products to educate consumers about the various species of ginseng available to them.

Response discussed at OHCRSC:
It was suggested that this recommendation be forwarded to Gilles Saindon, AAFC London and to AAFC Summerland.

2.Nutrient Management

c) That funding be made available to establish crop removal, and uptake numbers and
d) That nutrient recommendations be developed that are based on crop needs that address both quality and yield.

Response discussed at OHCRSC:
As there were multiple subcomittees that have made recommendations pertaining to nutrient management, the OHCRSC chair will work with the subcommittees to coordinate a response with the agencies involved.

3.GLP:

c) That financial assistance be made available to establish accessible GLP-certified sites for minor use trials.
d) That funding be made available to train personnel in GLP certification, coordination and supervision.

Response discussed at OHCRSC

All pest management priorities have been forwarded to OPMRSC.
The OHCRSC has agreed to work with OPMRSC to form a working group to pursue further discussion amongst personnel within OMAFRA, University of Guelph and Agriculture and Agri-Food Canada to look for ways to enhance coordination of GLP efforts in the province.

4.Rapid diagnostic techniques

c) That funding be made available to establish rapid diagnostic procedures and train staff in their use.
d) That diagnostic staff be increased during peak growing months to accommodate grower demands for quick turn-around.

Response discussed at OHCRSC:
The OHCRSC has agreed to work with OPMRSC to continue to discuss this need.
There will be some PCR diagnostics services offered through Ridgetown campus, University of Guelph on a limited basis in 2002.

5.Pesticide Harmonization:

That PMRA through Health Canada, accept crop grouping and harmonize crop mapping with the U.S.

Response discussed at OHCRSC:

Pest management priorities have been forwarded to OPMRSC.

6.Canadian Equivalent of IR4

That the Canadian equivalent of IR4 be established as an independent, arms-length, organization to assist the agricultural community with minor use submissions.

Response discussed at OHCRSC:
Pest management priorities have been forwarded to OPMRSC.

GRAPE AND WINE

1. Inadequate "Crop Protection Research" capacity to address important insect, mite and disease problems in grapes.
   Response discussed at OHCRSC:
   Forwarded to OPMRSC

2. Loss of conventional organophosphate and carbamate insecticide products with a lack of replacement registered products to control grape pests.
   Response discussed at OHCRSC:
   Forwarded to OPMRSC

3. Inadequate resources to conduct Good Laboratory Practices (GLP) residue trials to support Minor Use Registration Expansion Programs.
   Response discussed at OHCRSC:
   Forwarded to OPMRSC

4. Lack of harmonization of pest control products to support an expanding grape and wine industry. This could result in reduced global competitiveness and loss of both domestic and export market sales.
   Response discussed at OHCRSC:
   Forwarded to OPMRSC

GREENHOUSE FLORICULTURE

Issue: Impact of the impending Nutrient Management Legislation and how industry can participate in and take some ownership of the process.

It is recommended that the industry move to establish a Task Force on Environmental Standards with representation from OMAFRA. The role of the task force will be to:

- monitor progress of nutrient management legislation
- have input where appropriate into development of standards or targets for the industry
- investigate other environmental reporting systems and evaluate their suitability for Ontario

Response discussed at OHCRSC:
As there were multiple subcomittees that have made recommendations pertaining to nutrient management, the OHCRSC chair will work with the subcommittees to coordinate a response with the agencies involved.

Issue: Movement of product over U.S. Border

It is recommended that:

- The industry, in conjunction with OMAFRA (extension specialists, Economics Branch), investigates the development of cost of production figures for major greenhouse export crops.
- The industry (in collaboration with Flowers Canada-National and government agencies such AAFC-Market and Industry Services Branch, and OMAFRA-Market Development Branch) actively pursues a communication and lobbying campaign with the US industry (Society of American Florists), to improve their understanding and perceptions of our industry and how it is supported.
- The industry continues to maintain close ties with the Ontario Greenhouse Vegetable Growers and to closely monitor the anti-dumping action brought against the tomato growers.
- The Canadian Food Inspection Agency continues to support the industry in border issues falling within its mandate. Task Forces such as that created to deal with the Chrysanthemum White Rust issue, are an excellent means of keeping communication lines open, and should be looked at as a model for future issues. Priority should be given to improving communications with regional US port authorities to expedite resolution of delays and problems.

Response discussed at the OHCRSC:

The OHCRSC encourages the subcommittee to work with the government agencies and industry organizations involved to follow up on the well outlined needs that have been identified in this recommendation.

Issue: Continued Depletion of Government and University Personnel Resources directed towards the Floriculture Industry

It is recommended that:

- The University of Guelph expedites the filling of the faculty position in floriculture in as timely a fashion as possible.
- AAFC devotes equal entomological resources at Harrow to both greenhouse floriculture and vegetables
- AAFC replaces the pathology position at Vineland when it becomes vacant
- AAFC discusses the replacement of the engineer position at Harrow, with both the vegetable and floriculture industries
- Flowers Canada (Ontario) enters into discussions with (OMAFRA) Foodland Ontario to discuss domestic marketing of Ontario-grown floral product

Response discussed at OHCRSC:

The OHCRSC would encourage the subcommittee chair to forward this recommendation directly to the target agencies identified. AAFC will likely not fill the engineer position at Harrow, however, the subcommittee is encouraged to work with Natural Resources Canada to develop contact with their personnel and research initiatives.

Issue-Registration of new pesticides for the industry through the minor use registration program

It is recommended that:
PMRA make a serious commitment to minor use registration in all its aspects. PMRA should in particular address the above concerns to make the program more workable and attractive to companies with products having a novel mode of action (especially microbials). PMRA should also address the current gap existing between URMUR and URMULE, so that potential new products are not lost.

Response discussed at OHCRSC:
All pest management priorities have been forwarded to OPMRSC.

Issue-There is a need for better lines of communication within the floriculture industry, but also between it and various levels of government.
It is recommended that:
Flowers Canada (Ontario) conduct a review of its communication needs to determine if they can be met by existing systems, or whether they need to develop a new communication package tailored to its own needs. The review should include discussions with OMAFRA, Flowers Canada and the Cecil Delworth Foundation to determine the capabilities and limitations of their web sites.

Response discussed at OHCRSC:
Staff in OMAFRA Crop Technology are willing to participate in discussions pertaining to improving communication with the organizations identified.

GREENHOUSE VEGETABLE

Issue: Support for Minor Use
Increased funding and other support be provided for minor use registration of new products.

Response discussed at OHCRSC
Pest management recommendations have been forwarded to OPMRSC.

Issue: Incentives for environmentally sustainable systems
Provide incentives to the Ontario greenhouse vegetable industry to implement environmentally sustainable production systems.

Response discussed at OHCRSC:
It would be advantageous for the greenhouse vegetable industry to pursue environmentally sustainable production systems regardless of the availability of incentives.
Issue: Labour Shortages
A split-system (6 months + 6 months) is implemented in the access and management of offshore labour.

Response discussed at OHCRSC:

The subcommittee should contact the agencies involved in administering the program to discuss this need.

Issue : Pest Diagnostic Lab
Increased support be provided to the Pest Diagnostics Laboratory in Guelph.

Response discussed at OHCRSC:
Pest management recommendations have been forwarded to OPMRSC. The committee should contact the clinic directly to discuss the specific diagnostic needs that were identified by your subcommittee.

NURSERY/LANDSCAPE/ TURF

1. Development and Publication of Nutrient Management Guidelines
   recommends a concerted effort to develop and publish nutrient management guidelines for nursery, landscape and turf species.

Response discussed at OHCRSC:
As there were multiple subcomittees that have made recommendations pertaining to nutrient management, the OHCRSC chair will work with the subcommittees to coordinate a response with the agencies involved.

2. Development of Alternatives to Pesticides
   recommends continued support for research into alternatives to pesticides and integrated pest management in turf and nursery/landscape production, particularly the development of low risk alternatives to current pesticides.

Response discussed at OHCRSC:
Pest management recommendations have been forwarded to OPMRSC.

3. Dealing with Water Quality and Quantity Problems
   recommends continued research into water use and water management in turf and nursery/landscape production, as well as education and extension of the information to the producers.

Response discussed at OHCRSC:
The OHCRSC would encourage the subcommittee chair to forward this recommendation to the chair of the Ontario Soil Water and Air Research and Service Committee (OSWARSC)

4.Biology and Control of Emerging Pests

recommends specific research efforts into the biology and control of emerging pests, particularly those which have potential to become more important due to either long term climate change or loss of chemical control agents.

Response discussed at OHCRSC:
Pest management recommendations have been forwarded to OPMRSC.

5.Response to the Plum Pox Virus Problem

recommends a coordinated effort to deal with the effects of the plum pox virus problem.

Response discussed at OHCRSC:
Pest management recommendations have been forwarded to OPMRSC. The OHCRSC would encourage continued liaison with the Tender Fruit Industry on this issue.

6.Acquisition of Pesticide Use Data (Industry and Public)

recommends that accurate and current data on the use of pesticides by the industry and by the general public be acquired.

Response discussed at OHCRSC:
Forwarded to OPMRSC. The OHCRSC would encourage the subcommittee chair to contact the chair, Ontario Agricultural Economic Research and Services Committee to communicate this need.

7.Coordination of Matching Research Needs, Funding and Researchers

recommends an active process to match research needs with funding and researchers capable of meeting those needs.

Response discussed at OHCRSC:
The subcommittee chair indicated that this could be followed up within the subcommittee.

8.Acquisition of Current Industry Economic Data

recommends that current industry economic data continue to be acquired.

Response discussed at OHCRSC:
The OHCRSC would encourage the subcommittee chair to forward this recommendation to the chair, Ontario Agricultural Economics Research and Services Committee.
There has been funding available for eligible projects through the OMAFRA Special Research New Directions funding.

9.Dealing with a Chronic Labour Shortage

recommends that the chronic labour shortage in the industry be identified as a problem to be addressed by appropriate agencies.

Response discussed at OHCRSC:
The subcommittee chair should forward this recommendation to the Canadian Horticultural Human Resource Council. Mr. Gary Mawhiney, OMAFRA Human Resources Program Lead is also a good contact regarding labour issues in agriculture.

Response discussed at OHCRSC:
The OHCRSC would encourage the subcommittee to forward this recommendation the Ontario representative on the Canada Horticultural Human Resources Council.

10. Educating the Regulators
    recommends that every effort be made to ensure that agencies with regulatory responsibility in the industry (pesticide use, water, nutrient management) are given opportunities to be educated in the state-of-the-art of the industry in the appropriate area.

Response discussed at OHCRSC:
Forwarded to OPMRSC. The OHCRSC would encourage the subcommittee to undertake activities to provide information/invitations to the target agencies where you see that more information on your industry is needed.

POTATO

ISSUE: **The potential closure of research and other facilities in Ontario.**
It is recommended that OMAFRA and the University of Guelph reach an agreement to maintain all the University of Guelph infrastructure and that no closures of research or other facilities occur.

Response discussed at OHCRSC:
Contact the Innovation and Risk Management Branch, OMAFRA to discuss concerns related to the OMAFRA/U of G partnership agreement.

ROOT, BULB AND LEAFY VEGETABLES

Issue: Loss of Nematode Research Capabilities in Ontario
The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee recommends that action be taken to ensure that the ability to conduct nematode research of relevance to vegetable growers is maintained after the retirement of Dr. John Potter.
Response discussed at OHCRSC:
AAFC Response provided by G. Whitfield:
The committee chair can forward this recommendation to Gilles Saindon, AAFC. This need will be brought through the new team structure that will be in place April 2002 within AAFC.

Issue: Dedicated Funding for Nutrient Management Research
The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee requests that OMAFRA and Agriculture & Agri-Food Canada establish dedicated funding for research in the area of 'Nutrient Management Planning' specific to Ontario's horticultural crops including 'root, bulb and leafy vegetable' crops. (AAFC; OMAFRA, Research, Education, Laboratories and Risk Management Branch).

OMAFRA - University of Guelph programs are asked to give higher priority to NMP research issues in future programs (OMAFRA-University of Guelph).

In addition, the Ontario Root, Bulb & Leafy Vegetable Research & Services Committee requests that the provincial Minister of Agriculture, Food and Rural Affairs work to ensure that costs of implementing NMP legislation are not downloaded to Ontario growers, including those of root, bulb and leafy vegetable crops (Minister, OMAFRA).

Response discussed at OHCRSC:
As there were multiple subcomittees that have made recommendations pertaining to nutrient management, the OHCRSC chair will work with the subcommittees to coordinate a response with the agencies involved.

Issue: Modification of the Minor Use Regulatory Process
The removal of the crop residue subzones 5B, 7A, and 1A must occur if progress towards minor use is to be achieved. (PMRA)

The application of crop group labels for registration of safe and effective crop protection materials is necessary (PMRA)

True harmonization of data requirements for seed treatment registrations is necessary so that minor crop growers have access to this excellent risk reduction strategy. (PMRA)

The use of the US 'reduced risk' classification on minor use submissions for products that are classified as such in the USA is necessary. (PMRA)

The use of a more inclusive 'biopesticides' category in Canada is also necessary so that growers have equal access to these risk reduction tools. (PMRA)

A more responsive and cost-effective URMUR program is needed to secure access to many products currently only available to US producers. Registrants, sponsors and PMRA need to work closely together on each URMUR submission. (PMRA and CropLife Canada)

When funding is approved for URMULE projects, researchers should be able to request an advance on the approved funds so that research can be initiated in a more cost-effective manner (AAFC)

AAFC should set aside funding to establish an "office of Canadian minor use" that could coordinate and facilitate the needs of all minor crops commodities in Canada. The concept of an

"IR-4 North" coordinating office which can provide study directorship to minor use projects is recommended. (AAFC, Policy Branch)

Response discussed at OHCRSC:
Recommendation forwarded to OPMRSC. The subcommittee chair can also forward this recommendation directly to Mr. Bill Boddis, AAFC, Policy Branch

Issue: Certification and Maintenance of GLP-compliant facilities
It is strongly recommended that both the University of Guelph (Ridgetown) and Agriculture & Agri-Food Canada (Delhi & Vineland) act promptly to certify personnel, field station sites and laboratory facilities as GLP compliant. (U of G; OMAFRA-U of G; AAFC-SCPFRC)

Stable funding is needed from the University of Guelph and AAFC to provide base support to research facilities who have invested in GLP compliance in order that GLP-certifications are maintained (U of G; OMAFRA-U of G; AAFC - Research Branch)

Response discussed at OHCRSC
All pest management priorities have been forwarded to OPMRSC.
The OHCRSC has agreed to work with OPMRSC to form a working group to pursue further discussion amongst personnel within OMAFRA, University of Guelph and Agriculture and Agri-Food Canada to look for ways to enhance coordination of GLP efforts in the province.

SWEET CORN

ISSUE: The Sweet Corn Research and Services Sub-committee would like to see the re-allocation of funding to support the research required to support the needs of nutrient management planning legislation
The funding presently available for nutrient management research (eg: New Directions Agri-food and Rural Research Program) will not inadequately fund all the required research needed to meet the requirements under the nutrient management planning legislation. Additional funding is needed to meet the needs of this legislation.

ISSUE:. Lack of harmonization of pesticides between Canada and the U.S.. Limited funding for URMULE AND URMUR.
The Sweet Corn Research and Services Sub-committee encourages the PMRA and OMAFRA to continue to work with the EPA and IR4 in order to reduce inconsistencies in availability of pesticides between Ontario and US producers, and recommends that funding available to the minor use registration process be increased to allow more products to move through the system

Response discussed at OHCRSC:
All pest management priorities have been forwarded to OPMRSC.

ISSUE:. Claims of bee kills caused by applications of insecticides on sweet corn fields. The Sweet Corn Research and Services Sub-committee recognizes the concerns of the apiculture industry regarding bee kills and possible connection to the sweet corn industry. However, in order to facilitate research in this area, they are encouraged to include this issue, as the Sweet Corn Research and Service Sub-committee has done, as a research issue in their OHCRSC report.

Response discussed at OHCRSC:
The OHCRSC would encourage communication between the two subcomittees. The chairs of each subcommittee may want to ensure that there is representation from apiculture and sweet corn present at both subcommittee meetings in 2002.

TENDER FRUIT

Plum Pox Eradication
The TFRSSC recommends that, as part of a coordinated effort to eradicate plum pox virus in stone fruits in Ontario, research initiatives emphasizing the horticultural aspects of the disease are needed.

Response discussed at OHCRSC:
It is the understanding of the OHCRSC the University of Guelph has a call for proposals for Plum Pox research funding.

U of G Staffing
The TFRSSC recommends that the University of Guelph, Department of Plant Agriculture, complete the staffing of the stone fruit breeding position at Vineland Station

Response discussed at OHCRSC:
The OHCRSC would encourage the subcommittee to contact Dr. Clarence Swanton, Chair, Plant Agriculture, University of Guelph

Access to Crop Protection Materials
The TFRSSC recommends that that PMRA improve the registration process for crop protection materials including biologicals and biorationals

Response discussed at OHCRSC:
Forwarded to OPMRSC.

AAFC Staffing
The TFRSSC recommends that AAFC-Vineland continue to provide crop protection research and support to the tender fruit industry by the timely staffing of positions in entomology, pathology and nematology

Response discussed at OHCRSC
The committee is encouraged to forward this recommendation to Dr. Gilles Saindon and the Dr. Gary Whitfield, National Program Lead for Crop Protection, AAFC.

TOMATO

Access to Crop Protection Materials/Minor Use Registrations.
It is recommended that:

- Equal access to new pest control products available in the US be provided to Canadian growers and this can be accomplished with shared registration and residue levels set at the same time and at the same levels as the US. Canada still has a number of registration requirements unique to Canada which increases the cost of Canadian registrations, slows the process and often results in denial of access to products in Canada (Health Canada, PMRA).
- The registration process be speeded up so that Canadian farmers have access to the newer products at the same time as their US counterparts (Health Canada, PMRA).
- An office for minor use be established in Canada to expedite minor use registrations in Canada (AAFC and Health Canada).
- Adequate funding for the URMULE and URMUR programs be provided. AAFC should continue to fund projects at the 75% level. It is also suggested that OMAFRA split the remaining cost with grower commodity groups (AAFC, Policy Branch and OMAFRA).
- AAFC and the University of Guelph provide GLP compliant facilities to ensure that residue and other data development work required to support the minor use program may be carried out (AAFC Research Facilities in Ontario and University of Guelph).

Response discussed at OHCRSC
Recommendation forwarded to OPMRSC.

ONTARIO HORTICULTURAL CROPS RESEARCH AND SERVICE COMMITTEE 2001-2002

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AGROFORESTRY

Appendix 1: MEMBERSHIP OF AGROFORESTRY SUBCOMMITTEE - 2001

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APPLE

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GREENHOUSE FLORICULTURE

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A number of changes were made to the committee membership. Primarily, these changes were associated with bringing new grower members to the meeting.

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NURSERY/LANDSCAPE & TURFGRASS

OHCRSC - Nursery, Landscape and Turf Subcommittee, 2001

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Executive Officers Term: November 1999 – November 2001

ROOT, BULB AND LEAFY VEGETABLES

The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee is currently composed of 9 Grower representatives, 3 Industry representatives, 3 representatives of OMAFRA, 2 representatives of Federal Research (AAFC) and 6 representatives of University Research.

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4	Chaput, Jim	Member	OMAFRA	OMAFRA 1 Stone Road, W. Guelph, ON N1G 4Y2	519-826-3539	519-826-3567	jim.chaput@omafra. gov.on.ca
5	Chechak, Chris	Member	Industry	Stokes Seeds Ltd. 39 James Street, Box 10 St. Catharines, ON L2R 6R6	905-688-4300 (W) 905-646-8003 (Res. Farm)	888-834-3334	farm@stokeseeds.com
6	Cuppels, Diane	Member	AAFC	Agriculture & Agri-Food Canada Southern Crop Protection and Food Research Centre 1391 Sandford Street London, ON N5V 4T3	519-457-1470 x 274	519-457-3997	cuppelsd@em.agr.ca

7	Dick, Dave	Member	OTSGMB	1132 County Road 20 Leamington, ON N8H 3V7	519-796-2549 519-326-9495	519-326-4124	
8	Dobinson, Katherine	Member	AAFC	Agriculture & Agri-Food Canada Southern Crop Protection & Food Research Centre 1391 Sandford Street London, ON N5V 4T3	519-457-1470 x 276	519-457-3997	dobinsonk@em.agr.ca
9	Epp, David	Member	Grower & OPVG	1121 Essex Rd. 20 RR # 4 Leamington, ON N8H 3V7	519-326-7579 (H) 519-326-8146 (S)	519-326-4588	
10	Fraser, Hannah	Member	OMAFRA	OMAFRA P. O. Box 8000 Vineland Station, ON L0R 2E0	905-562-1674	905-562-5933	hannah.fraser@omafra. gov.on.ca
11	Garton, Ron	Member	Industry	Asgrow Seed Co. 2770 Effingham Road R. R. #1, St. Catharines, ON L2R 6P7	905-682-8101	905-682-8832	ron.garton@SVSeeds. com
12	Griffiths, Heather	Member	OMAFRA	OMAFRA P.O. Box 400 Ridgetown, ON N0P 2C0	519-674-1694	519-674-1564	heather.griffiths@omafra.gov.on.ca

13	Hamill, Al	Member	AAFC	Agriculture & Agri-Food Canada Greenhouse & Processing Crops Research Centre 2585 County Road 20 Harrow, ON N0R 1G0	519-738-2251 x 487	519-738-2929	hamilla@em.agr.ca
14	Huffman, Leslie	Member	OMAFRA	Ont. Min. of Agric., Food & Rural Affairs, Greenhouse & Processing Crops Research Centre Harrow, ON N0R 1G0	519-738-2251 x 499	519-738-2929	lhuffman@omafra. gov.on.ca
15	Hughes, Becky	Member	U. of G. New Liskeard	New Liskeard Ag. Res. Stn. University of Guelph Box 6007 New Liskeard, ON P0J 1P0	705-647-8525 x 222	705-647-9315	bhughes@onlink.net
16	Hunt, David	Member	AAFC	Agriculture & Agri-Food Canada Greenhouse & Processing Crops Research Centre Harrow, ON N0R 1G0	519-738-2251 x 427	519-738-2929	huntd@em.agr.ca
17	Ingratta, Claudio	Member	Industry	Sun-Brite Canning Ltd. Box 70 Ruthven, ON N0P 2G0	519-326-9033	519-326-8700	
18	James, Mac	Member	OF&VGA & ECAG	815 Road 4 R. R. #3 Leamington, ON N8H 3V6	519-326-7115	519-326-7115	rmjcj@wincom.net
19	Keller, Paul	Member	OTSGMB	1890 Rd 5E RR # 2 Ruthven, ON N0P 2G0	519-326-1991	519-326-4451	

20	LeBoeuf, Janice	Member	OMAFRA	OMAFRA P.O. Box 400 Ridgetown, ON N0P 2C0	519-674-1699	519-674-1564	janice.leboeuf@omafra. gov.on.ca
21	Liptay, Albert	Member	AAFC	Agriculture & Agri-Food Canada Greenhouse & Processing Crops Research Centre Harrow, ON N0R 1G0	519-738-2251 x 477	519-738-2929	liptaya@em.agr.ca
22	Loewen, Steve	Member	U. of G. Ridgetown	Ridgetown College of U. of Guelph Main Street East Ridgetown, ON N0P 2C0	519-674-1629	519-674-1600	sloewen@ridgetownc. uoguelph.ca
23	Marks, Frank	Member	OPVG	83 Rosehip Pl. London, ON N6K 4H4	519-471-3655		fmarks@uwo.ca
24	Morlock, Michael	Member	Industry	Cargill, 1060 CR8, General Delivery Staples, ON N0P 2J0	519-687-3012 519-818-0168(c)	591-687-2939	michael_morlock@cargill.com
25	Pitblado, Ron	Member	U. of G. Ridgetown	Ridgetown College of U. of Guelph Main Street East Ridgetown, ON N0P 2C0	519-674-1605	519-674-1600	rpitblad@ridgetownc. uoguelph.ca
26	Poysa, Vaino	Member	AAFC	Agriculture & Agri-Food Canada Greenhouse & Processing Crops Research Centre Harrow, ON N0R 1G0	519-738-2251 x 467	519-738-2929	poysav@em.agr.ca
27	Procyk, Paul	Member	Grower	Procyk Farms (1994) Ltd. R. R. #1 Wilsonville, ON N0E 1Z0	519-443-4516	519-443-4511	pprocyk@simcom.on.ca

28	Robinson, Darren	Member	U. of G. Ridgetown	Ridgetown College, U. of Guelph P.O. Box 400, Main Street East Ridgetown, ON N0P 2C0	519-674-1604	519-674-1600	drobinso@ridgetownc. uoguelph.ca
29	Roddy, Elaine	Member	OMAFRA	OMAFRA, 3rd Floor, Crop Technology 1 Stone Road, W. Guelph, ON N1G 4Y2	519-826-3760	519-826-3567	elaine.roddy@omafra. gov.on.ca
30	Shabatura, Mary	Member	OF&VGA	R. R. #1 Waterford, ON N0E 1Y0	519-443-5919	519-443-4643	shab@kwic.com
31	Smith, Dale	Member	Industry	H.J. Heinz Co. of Canada Ltd. Erie Street South Leamington, ON N8H 3W8	519-322-4042	519-322-4110	HZseedDS@wincom.net
32	Souza-Machado, Vince	Member	U. of G.	University of Guelph Dept. Plant Agriculture, Bovey Bldg. Guelph, ON N1G 2W1	519-824-4120 x 2585	519-767-0755	vmachado@uoguelph.ca
33	Thomas, Bill	Member	Industry	Thomas Canning (Maidstone) Ltd. RR # 1 Maidstone, ON N0R 1K0	519-767-1531	519-737-7003	
34	Traquair, Jim	Member	AAFC	Agriculture & Agri-Food Canada Southern Crop Protection & Food Research Centre 1391 Sandford Street London, ON N5V 4T3	519-457-1470 x 224	519-457-3997	traquairj@em.agr.ca

35	Uyenaka, Joe	Member	Industry	Cargill Ltd. P.O. Box 209 Alliston, ON L9R 1V5	905-979-0737	905-387-9110	
36	Verhallen, Anne	Member	OMAFRA	OMAFRA P.O. Box 400 Ridgetown, ON N0P 2C0	519-674-1614	519-674-1564	averhall@omafra. gov.on.ca
37	Versnel, Corey	Member	ECAG	817 Road 3 East R. R. #2 Kingsville, ON N9Y 2E5	519-733-4300 (F) 519-733-2593 (H)		
38	Whitson, Jim	Member	OPVG & OTRI	R.R. #4 Dresden, ON N0P 1M0	519-683-2309	519-683-1369	
39	Zandstra, John	Member	U. of G. Ridgetown	Ridgetown College, U. of Guelph Main Street East Ridgetown, ON N0P 2C0	519-674-1627	519-674-1600	jzandstr@ridgetownc. uoguelph.ca

Changes for 2002:
Delete Joe Uyenaka (replaced by Michael Morlock)
Replace Claudio Ingratta, Sun-Brite Canning with Jennifer Morlock
Add Ed Tomecek

ALPHABETICAL
LIST OF ABBREVIATIONS

AAFC	Agriculture and Agri-Food Canada
AAFC-GPCRC	Greenhouse and Processing Crops Research Centre Agriculture and Agri-Food Canadian
AFB	American Foul Brood
AFHRC	Atlantic Food and Horticulture Research Centre
AIMS	Agricultural Integrated Management Services
CARC	Canadian Agri-Food Research Council
CFIA	Canadian Food Inspection Agency
EPA	Environmental Protection Agency
EVB	Environmental Biology University of Guelph
FQPA	Food Quality Protection Act
GLP	Good Laboratory Practices
IPM	Integrated Pest Management
LCBO	Liquor Control Board of Ontario
MFTIP	Managed Forest Tax Incentive Program
MNR	Ministry of Natural Resources
NISA	Net Income Stabilization Account
NMP	Nutrient Management Planning
NRC-IRAP	National Research Council - Industrial Research Assistance Program
NSERC	National Science Engineering and Research Council
OAC	Ontario Agricultural College
OAMC	Ontario Apple Marketing Commission
OASCC	Ontario Agricultural Services Coordinating Committee

OBA	Ontario Beekeepers" Association
OBGA	Ontario Berry Growers' Association
OF&VGA	Ontario Fruit and Vegetable Growers' Association
OFM	Oriental Fruit Moth
OGGA	Ontario Ginseng Growers' Association
OGVPMB	Ontario Greenhouse Vegetables Producers Marketing Board
OHCRSC	Ontario Horticultural Crops Research and Services Committee
OMAFRA	Ontario Ministry of Agriculture, Food and Rural Affairs
OMSPA	Ontario Maple Syrup Producers' Association
OPMRSC	Ontario Pest Management Research and Services Committee
ORBLVRSC	Ontario Root, Bulb and Leafy Vegetable Research and Services Committees
OSCIA	Ontario Soil and Crop Improvement Association
OTFPMB	Ontario Tender Fruit Producers Marketing Board
OTSPGMB	Ontario Tomato Seedling Plant Growers' Marketing Board
PCR	Polymerase Chain Reaction
PMRA	Pest Management Regulatory Agency
PPV	Plum Pox Virus
SCPFRC	Southern Crop Protection and Food Research Centre Agriculture and Agri-Food Canada
SHB	Small Hive Beetle
SONG	Society of Ontario Nutgrowers
TFRSSC	Tender Fruit Research and Services Subcommittee
URMULE	User Request Minor Use Label Expansion
URMUR	User Requested Minor Use
WTO	World Trade Organization